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ABSTRACT

The project presented here explored the possibility of using computer-based systems to increase information access to non-text children's materials at the pre-school through elementary (6th grade) school levels. This final report includes an indicative summary as well as ten separate papers that describe a range of applications of proven computer techniques to school media center materials: (1) "Computer Access to Children's Media"; (2) "School Media Programs and Networking: A Position Paper"; (3) "Elimination of Redundancy in Keyboarding Bibliographic Data for Computer-Based Information Systems"; (4) "Subject Headings for Children's Materials"; (5) "Computer-Based Production of School Media Center Reference Tools"; (6) "Computer Searching of Materials for Children"; (7) "A Multi-Level Approach to Computer-Based Control of Indexing Vocabularies"; (8) "Children's Media Data Bank and Information Center: A Library Research and Demonstration Project"; (9) "A Generalized Test and Quiz Program"; and (10) "A Computerized Technique for Producing Cloze Text Materials." Project findings suggest important implications at the national, regional and local levels. Detailed reporting is planned for a later date. (Author/JD)

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Final Report

Project No. 475AH60146

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COMPUTER-BASED SYSTEMS FOR INCREASING INFORMATION ACCESS TO SCHOOL MEDIA CENTER MATERIALS

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ABSTRACT

COMPUTER-BASED SYSTEMS FOR INCREASING INFORMATION ACCESS TO SCHOOL MEDIA CENTER MATERIALS

Abstract.- School libraries and media centers, with few exceptions, have been slow to use computer-based information science techniques to increase information access beyond that provided by conventional library cataloging. A need for greater information access exists. This project undertook to explore the applicability of a range of proven computer techniques to school media center materials. Techniques explored included title-derivative indexing, bibliographic production, union and similar list production, production of searching aids, vocabulary control (thesaurus techniques applied to subject headings and to annotations), and coordinate computer searching methods - the latter indicating the most immediate promise for increased access without additional human indexing. Several novel techniques have been developed. The project has continued into the development and testing of a prototype Children's Media Data Bank. Project findings would seem to have important implications at the national, regional, and local levels. Detailed reporting is planned for a later date.

The activity which is the subject of this report was supported in whole or in part by the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

U.S. Department of Health, Education, and Welfare

Office of Education
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PREFACE

We would like to extend our thanks to George Bonsall and the Brodart Foundation for allowing us to use subject headings and entries from the Elementary School Library Collection; to David C. Remington for helping us to obtain MARC tapes for juvenile titles; to Edwin Blake Brownrigg for exceptionally competent help with programming problems and data analysis; to Josten, Inc. for use of some of their cataloging data; to Lois Rose for a listing of Library of Congress subject headings as applied to Annotated Cards and for her encouragement; to Harold L. Roth for advice on public library applications; to Mary V. Gaver for her understanding and endorsement; to all of our colleagues at the University of North Carolina at Greensboro; and to the many teachers and school and public librarians who have given us their assistance, advice, and criticism.

I am especially grateful for the dedicated and intelligent work of Carol Walters, Jerry Warren, and - of course - Lois Winkel.

Theodore C. Hines

INTRODUCTION

This report is quite brief and is submitted largely as a matter of record. The work done in the initial period of this project (1976-1977) has now been greatly extended to include the development and testing of a prototype Children's Media Data Bank, now fully operational.

This extension and subsequent experimental work with microcomputers provided for substantial further exploration of the concepts and procedures developed under the previous grant. The growth of microcomputing has changed many of our original perspectives. We will be able to report technical details much more fully and usefully at a later date.

What follows then is primarily an indicative summary rather than a full descriptive report. It is worth noting that this report was prepared and edited on a microcomputer and printer configuration costing less than $4,000 including purchased software.

BACKGROUND

So far, despite the fact that most school systems in the United States use computers for at least administrative purposes, there has been comparatively little application of library automation techniques in school library media centers or, for that matter, to public library children's services.

Where such applications exist, the effort has usually been to do just what the term "library automation" implies: that is, to automate existing library activities in order to make them more economic and/or efficient.

This may be contrasted with applications of computer-based information science techniques, where the primary effort is to extend information access to users - access beyond that conventionally made available by libraries and media centers.

The literature would indicate that to date almost no attention has be given to applying such information science techniques to materials published or produced for children.

We do not want to draw an artificial distinction between library automation and information science, but rather to indicate that the focus of this project has been on computer-based means of increasing information access beyond that conventionally provided rather, than on other library activities such as circulation or acquisition.

Users of Information Access to Children's Media

There are:

. . . 34,000,000 public school students

. . . 4,000,000 students in other schools

. . . 52,000 elementary school library media centers

. . . 8,500 public libraries with 5,500 additional branches, all serving children.

If we consider parents, educators, librarians, and others who work with children, it is evident that information services about children's media have a very large actual and potential audience.

Information Access

In recent years, information access to children's media through the cataloging services provided by the

Library of Congress, for example, has been much increased. The Annotated Card data provided by the Library of Congress has been accepted as the standard for the cataloging of children's materials by the American Library Association. Coverage of non-print media, while still thin, has been substantially increased. Not only are annotations now provided, but the number and nature of subject headings has been changed. The average number of headings assigned Annotated Cards is now nearly three - more than double the number assigned to adult book materials. More headings indicating genres or curricular uses are assigned. More fiction is given subject headings than ever before.

Despite this increase in information access through conventional cataloging, access points are still quite restricted. In contrast to the average of about three subject headings per item assigned to children's media, the average report entered in the ERIC (Educational Resources Information Centers) system is given eleven descriptors. ERIC resources are available through numerous computer search outlets. Except for the prototype Children's Media Data Bank, there appears to be no similar service for school media center or public library children's services materials.

Published indexes and bibliographies serve to augment cataloging access. Most such indexes and bibliographies are analytical in nature - that is, they provide author, title, and (sometimes) subject access to bibliographic units within larger works - to journal articles, plays and poems in anthologies, or to stories in story collections. Some bibliographies provide additional needed access to curricular areas or special topics.

Needed Additional Access

School librarians would agree on the need for much more in the way of access to materials than is now available. They agree on the need for substantial annotations - the access implications of this will be discussed below. They agree on the need for more geographic access, indicating for example when a work is set in a given country as well as when it is about that country. This need would be at least partially met by a computer search system using the geographic tags provided in the MARC record. Even the increased Annotated Card indications of geographic area do not meet this need, since the geographic indication may be in a subject subdivision, which does not constitute an access point, and since the entry may be direct (Williamsburg) while indirect access (Virginia) is required for some uses.

Similarly, the use of general cross-references (Animals SEE ALSO names of specific types of animals) makes it difficult to identify works dealing with a broad classed topic and the specific sub-topics contained within it. Sometimes this need may be met through the classification scheme by consulting the shelflist, but sometimes not. It is not met through the public catalog, in any case.

Other types of needed access include the ability to locate materials relating to particular curricular areas (community helpers, community resources) or to meeting particular childhood situations (fear of the dark, sibling rivalry, depictions of multi-racial situations, depictions of one-parent families, or depictions of characters of various ethnic backgrounds).

There is a need for information on interest and reading levels of materials, not only within the citations for materials, but directly accessible for coodination with other access points.

It should also be noted that conventional cataloging coverage is still nowhere near complete enough for non-print media, and does not cover many titles widely used in school and public libraries. It is these titles - particularly 16 mm film - which are least likely to be adequately cataloged in the field even by conventional cataloging techniques.

The above listing is indicative rather than complete, but may serve to show some ways in which conventional library cataloging is not meeting existing and important information needs of children and those working with children.

Nature of the Universe of Materials

This project has focussed almost entirely on trade (i.e., non-text) children's materials at the pre-school through elementary (6th grade) school levels. All types of materials have been considered: picture books, fiction, non-fiction, records, cassettes, games, some types of toys, filmstrips, kits, 8 mm film loops, videotapes, and 16 mm films.

This universe of materials has characteristics of its own as well as an unusual set of use characteristics, or ways in which users may approach the materials.

The universe is comparatively small. Book publishers list some 40,000 juvenile titles in print in the United States in 1977, but this figure includes a number of titles at the secondary level. Since 1968, only some 40,000 juvenile titles have been included in Library of Congress MARC (Machine Readable Catalog) records, and this figure also includes many titles above the sixth grade level.

If only in-print titles recommended for purchase at the elementary school level and below by such general selective recommending sources as the School Library Journal, Booklist, the Children's Catalog, and the Elementary School Library Collection are considered, the total is probably fewer than 15,000 really useful titles. Even if this figure were doubled to make generous provision for recommended out-of-print titles still held by libraries and for the fact that non-print bibliographic coverage is still inadequate, it is obvious that the universe of immediate current concern is both finite and quite small in comparison with most subject literatures and the coverage of many information services - ERIC may be considered as a related example and case in point.

Unlike the collections of many other types of libraries - university libraries, for example - children's media collections are or should be distinguished by the variety of different types of media they contain.

Given the small size of the universe of materials and the nature of the clienteles served, it is evident that there will be considerable and desirable duplication of titles both within and across library agencies serving pre-school and elementary school children. There is considerable duplication of titles even within relatively small individual agencies.

The universe of children's materials is, again speaking comparatively, relatively static. An excellent basic collection of 10,000 in-print titles is likely to add, using very rough figures, only about 1,200 titles per year and to have about 1,000 titles go out of print. Only about 2,500 juvenile book titles, including secondary level materials, are published annually.

Types of uses of these materials are likely to be highly repetitive, both because of the similarity of curricula and because of the general nature of patterns of children's, educator's, and parent's interests.

It is of interest and importance to note that computer-based library automation and information science techniques are most likely to be economic and effective under exactly such conditions as those which exist in relation to children's materials - a large actual and potential audience, a large number of service agencies (libraries and media centers) working with a relatively small and relatively stable group of materials, a high rate of duplication of titles within and across service agencies, and significantly repetitive and predictable requests for particular subjects, topics, and uses of materials.

COMPUTER-BASED INFORMATION ACCESS

It is difficult succinctly to characterize the various computer-based methods for information handling. Basic operations are, of course, posting of data, explosion of data to produce multiple access points from a unit record, and computer searching of data. These basic operations are combined in innumerable ways to produce bibliographies, bibliographic indexes; catalogs; title-derivative indexes such as KWIC, KWOC, and Permuterm; citation indexes; thesauri; coordinate indexes; searching aids, and other tools and services. Each of these tools and services may make significant variations on particular techniques, and several techniques may be combined in a single tool or service.

For the purpose of this project, a number of these techniques and variations have been explored: indeed, all of those named above with the exception of citation indexing which is not particularly suited to largely citationless children's materials. In some cases only small-scale experimentation or evaluation was undertaken. In other cases, very considerable work was carried out - analysis of 12,500 subject headings, for example.

Assumptions and Relevant Parameters

As already noted, the experimental universe was limited to non-text materials for children at the pre-school through sixth grade levels. While significant attention was paid to applications at the national or general level, and a major focus was on applications which could be successfully implemented at the regional, school district, or school level. Within this latter focus, an effort was made to distinguish techniques which could be used for training or self-training of school personnel; which could be begun simply and later elaborated using the same data; and which did not - at least initially - require significant human indexing effort and skills beyond those already applied in conventional library cataloging.

In regard to the latter, however, it is an important conclusion of this report that there is a need for more such indexing at the national level.

Work Accomplished

Specific tasks accomplished during the grant period or initiated during that period (not listed in any particular order of importance) include:

1. Keyboarding, analysis, and computer manipulation of 12,500 subject headings and subdivisions assigned a basic current collection of 10,000 volumes.

2. Establishment of a MARC-linked keyboarding protocol for juvenile media and for the organization of a data bank of these media.

3. Production of search (Boolean coordination) programs for such a data base.

4. Analysis of requisite data elements for a data base.

5. Production of alphabetical lists showing frequency and rank/frequency lists of subject headings and subdivisions for 10,000 juvenile titles, plus such lists for the words in subject headings and subdivisions and in the annotations fo this universe.

6. Production of selective lists of related headings as searching aids.

7. Testing of various types of title-derivative indexing, particularly on non-print media.

8. Development of protocols for augmenting data bank access in accordance with use (partially based on MITRE techniques).

9. Development of a technique for indexing groups of reference tools (later applied to 183 books on a non-OE project).

10. Development of simple alerting service systems (SDI, bibliographic listings) for application by staff inexperienced in computing.

11. Basic system design for union lists and similar tools, on the basis indicated in 10 above.

12. Numerous other applications, partially indicated by attachments to this report.

Conclusions

Only major conclusions are indicated here.

1. The assumption that information science techniques can usefully be applied to juvenile materials was validated.

2. Thesaurus techniques should be applied on the national level to production of heading lists for juvenile titles. They should be based on inclusion of all headings assigned juvenile titles cataloged for exemplary collection

on a rolling basis of, probably, a ten-year period. Lists of used terms, permutted terms, classed terms, and hierarchies of terms would be highly useful.

3. There is a definite need for a children's media data bank, just as there is a need for an ERIC system.

4. The universe of children's media of current use value is finite, comparatively small, and readily manageable. Small data bases have special information handling characteristics. These characteristics have been studied.

5. Title derivative techniques are quite applicable to providing access to previously uncataloged titles, especially non-print media.

6. School media centers can use simple, expandable, economic computer-based techniques to immediately expand access while simultaneously providing for staff training.

7. Applications such as those above can mesh with broader networking activities.

We are at present working on expanded reporting in book, journal article, and report forms.

COMPUTER ACCESS TO
CHILDREN'S MEDIA

David H. Jonassen

Theodore C. Hines

Mary Frances K. Johnson

COMPUTER ACCESS TO CHILDREN'S MEDIA

David H. Jonassen
Theodore C. Hines
Mary Frances K. Johnson

An Office of Education grant under the Library Research and Development Act has provided the Library Science/Educational Technology Division of the University of North Carolina at Greensboro with funds for experimentation with a machine-readable data base for children's media.

The overall goal of this project is to use computer capabilities to augment information access to materials for children at the elementary school level in a number of different ways. This article discusses only our experience with computer searching (both on-line and batch) in relation to non-print materials.

Our data base is still quite small, consisting of cataloging and bibliographic information (including annotations and reading and/or interest levels) on fewer than 4,000 titles. Of these, about 1,500 are non-print materials at all elementary school grade levels, in all commonly used formats except 16mm film. These formats include 8mm film, filmstrips, records, transparencies, cassettes, charts, slides, maps, games, sound filmstrips, and multimedia kits. At present, print titles in the data base are restricted to those useful with children at the pre-school and early elementary grade levels.

Our eventual goal is to include all currently available materials at the elementary school levels included in such basic selective listings or recommended titles as the Children's Catalog, the Elementary School Library Collection, and Booklist. At present, the non-print materials in the data base are restricted to those selected for the Elementary School Collection. (The Children's Catalog, of course, lists only printed materials.) We are very grateful to the Bro-Dart Foundation, publishers of the Elementary School Library Collection, for permission to use their cataloging information, including the excellent annotations.

Although the present data base is small, it should be noted that it includes all non-print media items in the only monographic basic selection aid in the field which covers them. We estimate that the active available titles, print and non-print, recommended in all of the basic selection tools represent not more than 15,000 items. Of these titles, we think it likely that not more than some 2,000 would be non-print items, based on consideration of annual production, in-print status, and problems encountered by publishers of selection tools and reviewing journals in obtaining non-print titles for review. Thus, the present data base is not so unrepresentative as might first appear.

While we are adding more access points for the materials than those provided by conventional cataloging, our experiences in doing this will be discussed elsewhere. Our concern here is with results which may be obtained by computer searching of quite conventional cataloging and bibliographic information.

While we have used our own input format for reasons of economy, editing ease, and ability readily to add information in addition to conventional cataloging data, our entries are linked to Library of Congress Machine Readable Cataloging (MaRC) records by inclusion of Library of Congress Card Numbers. We have a program which applies our search algorithms to MaRC tapes, and have received from the Library of Congress records for the we[illegible] over 30,000 juvenile titles, a[illegible] grade levels, now included in MaRC. Our data base, however, includes a large number of titles, expecially non-print titles, not available in MaRC.

To date, we have conducted somewhat more than 200 searches in response to all kinds of requests from students, faculty, parents, day-care center staffs, and school and public libraries.

Because the data base is small, and because only parts of it need usually to be searched for any one request, it is possible for us to do serial searches--that is, to avoid having to construct the complex inverted files which would be required for random access to the various data elements to be searched on.

The search algorithms provided for in our programs are quite complex, however. Searches may be made for character strings, words, or phrases in any or all or any combination of the data elements in the entries, using any Boolean relationship between or among terms.

Costs for computer time for searches and hard-copy printout are low, averaging under five dollars per search. Output may be provided in 8½ by 11 paged format, with running heads, suitable for direct reproduction.

Of special value in relation to non-print media searching is the fact that it is equally easy to retrieve listings of materials on given topics by physical form or media format--or without regard to their form--whereas a conventional catalog usually provides only one of these means of access. We can retrieve, obviously, all titles with a particular subject heading or author. We can also locate any title with a subject heading which has any given subdivision: AFRICA, for example. The latter access point is not, of course, possible in conventional cataloging.

Even more interesting is our ability to retrieve materials by searching for words or phrases in the annotations. A search for the word "ART: in annotations of materials at the early childhood level locates, for example, the filmstrip on Don Freeman's Norman the Doorman where neither the title nor the subject headings show that the story is set in an art museum.

This technique is particularly useful when a given item is not about a particular topic (and hence does not get that topic as a subject heading) but relates to that topic and may be used for a particular purpose. We have used it to locate materials with characters representing particular racial or ethnic groups or occupations, materials set in a given locale, materials incidentally including such objects of fascination to individual children as tractors, and so on. In addition, it has been useful in locating materials of use in values education, or for materials for helping to deal with such familiar childhood situations as fear of the dark or sibling rivalry. In all of these instances we have located useful items we could not hvae found through conventional search techniques.

Such searches do not, of course, locate all possible useful titles, as they depend on the accident of inclusion of words in annotations. It is our own feeling that the nature of annotations may change somewhat as the use of computer searching becomes more general.

Many of our searches produce a high percentage of false drops--that is, items which match the search criteria but are not suitable for the purpose the searcher has in mind. In general, however, these may easily be identified by scanning the annotations in the output listing.

We have so far produced four printed lists which serve as searching aids, helping both to minimize false drops and to maximize hits. One is a classified list of used subject headings such as those about animals, community services, and so on, which include every specific heading falling in that group. Another lists all subject headings and subdivisions used together with their frequency of occurrence. The two final lists are frequency counts of the words used, respectively, in subject headings and in annotations. The latter is fascinating in some of its implications--"he" is far more frequent than "she" and "mother" more frequent than "father"--and permits very interesting searches, for example, for materials showing various emotions.

We believe our work so far shows that computer searching techniques may be economically, practically, and usefully applied to juvenile materials--perhaps especially useful to non-print media. Comments, criticism, suggestions, or notification of similar work done elsewhere will be most gratefully received.

We should like to acknowledge the very substantial contributions to this project of research associates Carol Walters, Jerry Warren, and Jane Martin, as well as those of our OE grant officer, Larry Papier.

SCHOOL MEDIA PROGRAMS AND NETWORKING

A Position Paper

by

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and

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June, 1977

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PREFACE

The Literature

Information sources on which this position paper is based include a search of the ERIC data base (see Appendix) and manual searches of Library Literature (1970-date), Information Science Abstracts, and the Annual Review of Information Science and Technology. In consulting these sources emphasis was placed on reference to school media program participation in networking, interlibrary cooperation, and applications of automation. Additional information was obtained from current reports furnished by staff and members of the National Commission on Libraries and Information Science (NCLIS) Task Force on the Role of the School Library Media Program in Networking. The general literature on library networking and interlibrary cooperation was also reviewed.

From this review the writers may safely conclude that (1) there is a paucity of published information concerning school libraries and networking, and (2) for those programs that are described in printed sources, the available data lack completeness and/or comparability.

The second (although not the first) of these conclusions is supported by Kraus (17) in his observation that:

> The literature of library cooperation is very large and most of the articles are uncritical. Although most of the cooperative enterprises of libraries are announced and described in library periodicals, there are few evaluative reports that give a clear account of the success of a venture and the factors leading to success or failure. (p. 171)

DeJohn (10) makes a comparable assessment of the literature on multitype library networking: "I don't think any definitive study has been done. One of the problems is reading about these programs getting under way, and then seldom reading whether they are successful." (p. 47) This appraisal clearly applies to much of the published material on school library networking activities, in which the information provided is uneven in depth and frequently lacking in critical evaluation of the operations reported.

It is reasonable to suppose that the small number of publications found pertaining to school library networking reflects the limited participation of school libraries in networking, rather than neglect of the role of school libraries in networking.

A number of indices can be identified by which to test the viability of school library participation in networks. These indices may be grouped, roughly, into four categories:

(1) Professional recommendation. Chief examples include the guidelines provided in the national standards for school media programs (2), and the recommendations made by Shank, in Guide to the Development of Educational Media Selection Centers (31), for a system of special purpose networks at the local, regional, state, and national levels.

(2) Position papers affirming the importance of school media program participation in networking, e.g., Franckowiak (15).

(3) The agenda of library conferences (programs and reports), as well as legislative programs at state and national levels. The literature here is sparse indeed.

(4) Reports of existing and planned programs of networking involving school libraries. As noted above, the literature

identified is limited in scope and depth of coverage.

Definitions

For the purposes of this paper the writers have adhered, generally, to the broad definition of "network" employed by the National Commission on Libraries and Information Science (24), i.e.:

> Two or more libraries and/or other organizations engaged in a common pattern of information exchange, through communications, for some functional purpose. A network usually consists of a formal arrangement whereby materials, information, and services, provided by a variety of types of libraries and other organizations are made available to all potential users. (Libraries may be in different jurisdictions but agree to serve one another on the same basis as each serves its own constituents. Computers and telecommunications may be among the tools used for facilitating communication among them.) (pp. 82-83)

This definition encompasses activities categorized as "networks" and/or as "consortia," in the sources consulted. A number of sources make a closer distinction between networking activities and other types of interlibrary cooperation, e.g., Miller and Tighe (22), who address their survey of networks to ". . . those resource-sharing activities that employ computer and communications techniques, and to arrangements among several separate and independent institutions." (p. 174)

The terms "school library" and "school media program" are used interchangeably in this paper, reflecting the usage found in the literature.

OBJECTIVES OF NETWORKING

From the general literature on interlibrary cooperation, objectives for library consortia, based on those proposed by Delaney and Cuadra (12), are delineated by Fetterman (14) as follows:

(1) Assist member libraries in the selection of materials

(2) Purchase, catalog, and process library materials

(3) Coordinate cooperative acquisitions, interlibrary loans, and the reproduction of materials for the member libraries

(4) Promote the development of programs for the expanded use of library resources

(5) Stimulate the improvement of library facilities and services

(6) Cooperate in the development of library personnel

(7) Provide, through cooperative acquisition by voluntary agreement, materials beyond the reach of individual libraries

(8) Achieve economies in the use of resources, both human and material

(9) Facilitate sharing of materials among members of the group. (p. 10)

Schwartz (30) asserts that:

> . . . the improvement of the traditional form of library cooperation, i.e., the coordination and interchange of library materials, is rivaled by the importance of new and different types of library cooperation. Illustrative is the need for a coordinated program for continuing education, which updates and revitalizes the librarian's view of user needs, service patterns, and library cooperation. Better coordination of newer formats--such as audiovisual materials, microforms, and computerized data bases--is needed. The applicability of the technologies of computers and telecommunications to user information requirements demands better understanding. (p. 224)

The need for school media program participation in networks is acknowledged in specific terms by Media Programs: District and School (2).

Franckowiak (15) outlines services that regional media programs and/or intertype library consortia can offer individual school and school district media programs, including materials processing, retrieval of information and materials, and library/media staff development. In return, he observes, school media programs can offer to other types of libraries their special expertise in the uses of newer media formats and in the selection, organization, and utilization of the full range of media. DeJohn (10) acknowledges these potential contributions of school media programs to intertype library cooperation (p. 56). Altman's study (1) supports the feasibility and value of interlibrary loans among secondary school libraries of comparable development, as well as the loan of materials from such school libraries to smaller public library units.

THE NEED FOR PARTICIPATION: PROS AND CONS

Schwartz (30) emphsizes the need ". . . to take a critical look at the validity of library cooperation based on the recent increase of user need and demand studies and to determine whether cooperation really has been and will continue to be the key to meeting those needs and demands, based on the information and library needs of users and potential users." (p. 215)

DeJohn (10) notes that "networking is built on mutual trust. You have to be willing to share what you have with others in a spirit of unselfish cooperation, and . . . it's never equal. It's based on the concept of 'what can I do for you,' not, 'what's in it for me.'" (p. 50) He appraises the benefits of networking, to a participating library, as including the following:

(1) Access to greater resources than available in any one library. . .

(2) Freedom from routine processing tasks, (thus) providing (for) more user contact with librarians

(3) Access to special information banks; reference services in depth

(4) Provision of multimedia and learning centers to a greater audience

(5) The interaction with the community in an active way, anticipating services geared to local needs and problems, and discovering where the resources are

(6) Sharing of expertise and unique resources to strengthen the whole. (p. 49)

DeJohn further identifies possible disadvantages of participation in networking as follows:

(1) Networks do require standardization and compatibility. . .

(2) Willing abandonment of self sufficiency and acceptance of a sharing concept

(3) Participation in group decision making and abiding by those decisions

(4) Shifting of some power from local to network

(5) Retraining of staff

(6) A total commitment to (the) network concept. (p. 50)

Needs of school media programs and potential benefits to be derived from participation in networks are projected in the latest recommendations from the American Association of School Librarians' Committee on Networking (28). Needs and potential benefits recognized by the committee include the following:

(1) Access to media: rapid access to high cost, infrequently used, or specialized materials and equipment; awareness of the holdings of other libraries and information agencies; access to sophisticated production facilities; cooperative storage of less-used media

(2) Information services: supplementary reference and referral services; access to a wide range of bibliographic tools, including electronic data bases

(3) Selection: access to examination centers to preview new media; access to a wide range of selection tools

(4) Technical services: access to efficient, high quality centralized cataloging and processing for media in all formats

(5) Personnel: access to specialists and consultants (e.g., design of facilities, security, preservation, production); access to resource persons (e.g., subject area specialists); access to staff development (in-service education) opportunities

(6) Public information and education: public awareness . . . of the school media program's mission, needs, and available resources

(7) Support: broad based support (for) financing, resources, and services.

For each of the seven areas under which school media program needs and potential benefits are grouped above, the committee also identifies (1) strengths and potential contributions offered by school media programs to networks, and (2) recommendations for consideration by participants in network planning at any level.

Feasibility. One question which arises in connection with the development of school library participation in networking is that of technical feasibility, particularly in regard to availability of computing equipment. As far as computers themselves are concerned, computing equipment is or shortly will be available in most school systems in the country, although the suitability of this equipment to particular applications may pose problems. In most communities, however, suitable computers are available in the school district itself, through municipal government, or through some other agency or service bureau.

The cost of computing, including the cost of terminals and other peripherals, is not now high enough to be a deterrent to development of well-designed systems, and these costs are rapidly dropping rather than increasing even in the present period of inflation.

While it cannot be said that data base needs are met as yet, certainly the Annotated Card materials in MaRC (over 30,000 titles), the NICEM data base, and the RIE and CIJE materials available through ERIC constitute substantial resources that have not as yet been sufficiently exploited.

The greatest problem in regard to technical feasibility of school library participation in networking, at present, is probably not lack of necessary equipment, nor cost factors, but rather the lack of trained personnel. This latter problem requires serious consideration.

TYPES OF INTERLIBRARY COOPERATION

Four general types of library consortia, in a statement adapted from Patrick (26), are described by Montgomery (23):

(1) "Large" consortia, which are concerned primarily with computerized, large-scale technical processing. A "large" consortium may comprise a few large scale libraries or a larger number of small libraries often geographically distributed over a state. "Large" consortia seem to be required for long range, large scale projects. The New England Library Information Network (NELINET) and the Ohio College Library Center (OCLC) are examples.

(2) Small consortia which are concerned primarily with user services and everyday problems. A characteristic of this type of consortium is geographical proximity which facilitates telephone and face-to-face communication. Smaller consortia provide an opportunity for individual involvement. Projects such as reciprocal borrowing privileges, workshops, specialization of acquisitions, storage, small-scale automation projects, and multimedia projects. An example of this type of consortium is Tri-State College Library Cooperative (TCLS).

(3) Limited-purpose, cooperating with respect to limited special subject areas. Activities here include building special collections, providing reciprocal borrowing privileges, and maintaining union lists. The Consortium of Western Colleges and Universities, headquartered in California, is an example of this type of consortium.

(4) Limited purpose consortia, concerned primarily with interlibrary loan or reference network operations. A state-wide network which facilitates interlibrary loan is an example. (p. 294-95)

A closer analysis of the role of school libraries in networking suggests the following dimensions: (1) clienteles to be served, (2) networking relationships, with respect to types of libraries/other agencies represented and to level (within school district, community, region within the state, state-wide, interstate, and national), and (3) types of networking activities.

Clienteles to be served may include students, faculty, school administrators, parents, community groups and individuals, school boards, and city/county governments (with additional clientele added at regional, state, interstate, and national levels).

Networking relationships possess at least two dimensions, the level of operations and the types of libraries/other agencies participating. Within the single school district, a network may link individual school media centers, centralized professional collections, and/or instructional resource centers whose collections and services augment those of individual school media centers. At the community level, networks may encompass other schools and school districts; public library systems; community college/technical institute learning resources centers; special and other libraries. A similar spread among types of libraries may be represented in some regional networks, whereas other regional networks may serve only school media programs. State-wide networks may add to the mix the state library agency (including any existing networks) and/or state education agencies. Examples of interstate networks applicable to school libraries include OCLC, Solinet, and others. At the national level, existing resources include federally-sponsored data bases, such as MaRC and ERIC; federally-supported special purpose programs such as those sponsored by the Bureau of Education for the Handicapped, Learning Resources Branch (BEH/LRB); and commercial data bases, e.g., Lookheed's DIALOG.

Kraus (17) sorts library cooperative activities into the following broad divisions: (1) interlibrary lending, (2) bibliographical access, (3) specialization agreements, (4) cooperative processing, and (5) organization for cooperation. (p. 171) A more specific listing of school library networking activities would include:

(1) Individual reciprocal borrowing, with return to any network institution

(2) Interlibrary loan and provision of photocopies

(3) Communications and delivery systems, e.g., TTY, facsimile transmission, telephone, mail, United Parcel Service (UPS), and network operated delivery systems

(4) Individual reference and in-library use privileges in all network institutions

(5) Evaluation centers

(6) Centralized bibliographic tools and services, including union lists, directories, newsletters

(7) Cooperative selection and acquisition agreements, e.g., specialization and/or provisions for rotation of some materials

(8) Referral services

(9) Centralized acquisitions

(10) Centralized cataloging and processing

(11) Duplicates exchange

(12) Last copy or little used materials storage

(13) Equipment loan or repair

(14) Cassette, videotape, microfilm, microfiche duplication

(15) Special collections of instructional materials

(16) Computer data base search facilities

(17) Network publicity, public relations, and publication services

(18) In-service education

(19) Consulting services

(20) Staff exchange

A useful model of the parameters of current library consortia is furnished by Montgomery (23), in a model adapted from Patrick (26):

(1) Type
  (a) Member of higher educational consortium
  (b) Independent entity
(2) Area Served
  (a) City
  (b) Region
  (c) State
  (d) Interstate
(3) Headquarters
  (a) Centralized
  (b) Not centralized
(4) Objectives
  (a) Design objectives or goals
(5) Stages of Development
  (a) Planning stage
  (b) Development stage
  (c) Operational stage
(6) Funding Sources
  (a) Dues or fees
  (b) Grants
  (c) Contributed resources
(7) Funding Level (Annual)--usually funds for material or services beyond staff time
(8) Type of Agreement
  (a) Legal
  (b) Informal

(9) Rules for Participation

  (a) Specified

  (b) Unspecified

(10) Computer Usage

  (a) Has computer

  (b) Uses university computer

  (c) Uses service bureau

  (d) Does not use computer

(11) Membership County--simple numeric count of participating members (libraries/agencies)

(12) Activities--list of operational cooperative activities

(13) Direct Services from Headquarters--list of services if different from activities

(14) Leadership

  (a) Director or Coordinator

  (b) Advisory Board (pp. 290-91)

This model offer a guide for the collection and analysis of baseline data on current network participation of school media programs.

SCHOOL LIBRARY PARTICIPATION IN NETWORKS

Examples of school library participation in networking activities, gleaned from literature searches, are outlined below.

CALIFORNIA

- Los Angeles Unified School District. Automated Instructional Materials Handling System (AIMS)

  Includes materials selection, ordering, control, online film booking, textbook control, and accounting and budgeting functions.

  References: Axford (4); Shank (31)

- California Library Authority for Systems and Services (CLASS)

  Newly formed as a Joint Powers Agreement, to set up a statewide network of services. Includes public and private school libraries.

  Reference: May (21)

ILLINOIS

- The Illinois Library and Information Network (ILLINET)

  ILLINET is composed of local public, academic, special, and school libraries, 18 library systems, 4 reference and research centers, and 3 special resource centers. Extent of and barriers to school library participation are reviewed by Drescher (13).

  References: Bolt (7); DeJohn and Lamont (11); Drescher (13)

- Illinois Valley Library System

  A multitype library cooperative, based in Peoria, which includes public, academic, school, and special libraries. A recent reduction in funding, with planned termination of over-the-counter loans of nonprint materials, is reported by Library Journal (20).

ILLINOIS (continued)

References: Booth (8); Library Journal (20)

- Suburban Library System

An LSCA grant "to hire a liaison consultant for both public and school libraries," who will "concentrate on training personnel in some 300 participating libraries on implementing their own cooperative programs," is reported (19).

Reference: Library Journal

- Wheaton-Warrenville School District

A School-Community Resource Center serves both school and community people, providing access to a photography lab, a TV studio, audio facilities, and a library of educational materials, staffed by trained personnel.

Reference: Library Journal (19)

MARYLAND

- Montgomery County Schools

Reference data base; to be described by Karen Dowling in an article scheduled for publication in the Fall 1977 issue of School Media Quarterly.

MASSACHUSETTS

- Braintree

The Braintree Librarians and Media Specialists (BLAMS) group, which includes public school, private school, and public library membership, adopted a policy statement acknowledging mutual concerns and dependence, and is organizing cooperative ventures.

Reference: Library Journal (20)

NEW JERSEY

- Burlington County

An LSCA-funded cooperative program activated in September 1976 by selected Burlington County libraries, including high school, public, and county college libraries. Designed to improve service by increasing resource sharing and decreasing

NEW JERSEY (continued)

delivery time. Participating libraries are linked by telephone and teletype service, with van delivery service.

Reference: School Media Quarterly (29).

NEW YORK

- Levittown Public Library

Provision of professional education materials for school district faculty.

Reference: Reported by Theodore C. Hines

- Rockland County

"A new library-media center at Rockland Community College houses the Board of Cooperative Educational Services (BOCES) communications media service as well as the college's audiovisual service," and serves both the college and the eight county school districts. Services include a film library (3,000 titles), reading resources center, materials production, and communications media planning and development (32).

Reference: Wilkins (32)

- Scarsdale Public Schools

Computerized union list of periodicals: school and public library.

Reference: Reported by Theodore C. Hines

NORTH CAROLINA

- University of North Carolina at Greensboro

Work is proceeding on a prototype data base of data on children's materials at the elementary school level, expected to include all recommended basic titles in all media except 16mm film by 1979.

OREGON

- Oregon Total Information System (OTIS), Eugene

An article by Nicola Laird, describing the OTIS career information data base, is scheduled for publication in the Fall 1977 issue of School Media Quarterly.

OREGON (continued)

References (general): Axford (4); Blair and Snyder (6)

- OTIS Automated Library Services (OALS)

  Catalog production, ordering, processing, evaluation of media, online booking and scheduling, ERIC computer searching, and textbook control functions.

  Reference: Axford (4)

- Project LEEDS, Springfield Public Schools

  Combined the demonstration of the Springfield Public Schools' existing library program and a feasibility study of an automated library system for acquisitions, cataloging, and processing of materials.

  Reference: Blair and Snyder (6)

PENNSYLVANIA

- Coraopolis, Pennsylvania

  Computerized listing of all audiovisual media formats owned by district schools, to facilitate interlibrary loan.

  Reference: Reported by Blanche Woolls

UTAH

- Utah State Library Commission

  The Commission's Technical Services Division has expanded its purchasing and processing service to include all public school media centers in the state.

  Reference: Library Journal (19)

WASHINGTON (STATE)

- Washington Library Network (WLN)

  School participation in this network is to be described in an article by Audrey Kolb and Jo Morse scheduled for publication in the Fall 1977 issue of School Media Quarterly.

  Reference (general): Purdy (27)

WISCONSIN

- Intertype Library Councils (4)

  Non-profit educational corporations with tax-exempt status. Membership includes libraries of all types: academic, special, public, and school.

  Reference: Branson (9)

- Cooperative Educational Service Agencies (CESAs)

  Intermediate educational service units; functions vary.

  Reference: Branson (9)

- University of Wisconsin-River Falls Tri-County Cooperative Film Library

  Serves a university and eleven area public school districts.

  Reference: Krueger (18)

CANADA

- Calgary Public Library

  Educational Reference service for teachers, including table of contents service, is provided by the public library and funded by the school system.

  Reference: Reported by Theodore C. Hines

Augmenting this list of local, regional, and intra-state networking activities in which school media programs participate is the example of nationwide media and materials support services offered by the Bureau of Education for the Handicapped, Learning Resources Branch (BEH/LRB), whose network is described in an issue of Apropos (3):

> The National Center on Educational Media and Materials for the Handicapped (NCEMMH) is a major unit within the learning resources program. In addition to NCEMMH, there are four Specialized Offices (SO's) and thirteen Area Learning Resource Centers (ALRCs). NCEMMH and the four specialized offices have national roles and responsibilities, while the thirteen ALRC's have regionalized roles and responsibilities. This program, collectively referred to as the ALRC/SO/NCEMMH network, complements a separate but related BEH/LRB program of regional resource centers which have a mission related to identification of, educational diagnosis of, and prescription for handicapped students.

The ALRC/SO/NCEMMH program is designed to interface with state and local media-materials programs and to provide supportive services to those programs so that the following general goals may be achieved:

(1) Where appropriate materials do not exist to meet the needs of handicapped students--needed materials can be made available through adaptation/modification of existing materials and/or development of new materials to meet identified student needs.

(2) Where users of materials are not aware of existing materials that will meet the needs of the handicapped--information about relevant and usable materials and media will be made available to the potential user.

(3) Where users know about the availability of existing materials that will meet needs of handicapped students, but do not have physical access to these materials--materials will be made accessible on a convenient basis.

(4) Where materials are accessible but the potential user does not know how to use them effectively--users will have access to information and assistance in the use of materials.

The brevity of this listing reflects the limited information available in the literature, as indicated in the Preface.

Young (34) identifies fifteen states reporting on single and multi-type library systems, networks, and consortia involving schools, from the recent ALSA Report on Interlibrary Cooperation: California, Illinois, Michigan, Minnesota, Montana, New Hampshire, New Jersey, North Dakota, Ohio, Rhode Island, South Dakota, Tennessee, Virginia, Washington, and Wisconsin.

Blanche Woolls (33) surveyed state library agency staff attending the NCLIS Management Institute for State Librarians, held at the University of Pittsburgh in March 1977, asking (1) whether school libraries are a part of networks in the respondent's state and (2) what are viewed as the major problems in involving school libraries in networking. Fourteen respondents stated that school libraries are included in networks in their states; two gave a qualified "yes"; seven replied "no"; the remainder (number not stated) gave no reply.

PREREQUISITES TO PARTICIPATION

Fetterman (14) cites the 1967 joint statement on interlibrary cooperation approved by the boards of directors of ACRL, AASL, PLA, and ASLA, in which the following prerequisites to fruitful interlibrary cooperation were identified:

> (1) That primary responsibility of each type of library to its special clientele must be identified before interlibrary cooperation can be established to augment service;
>
> (2) That effective cooperation depends upon adequate resources, administrative capability, and efficient communications;
>
> (3) That although the primary responsibility of each library must be respected, each library must realize its responsibilities to the network and assume its appropriate share of responsibilities;
>
> (4) That all libraries must maintain an attitude of flexibility and experimentation.

Franckowiak (16) emphasizes the necessity for strong media programs at the individual school and district levels, as the "primary libraries" for students and teachers, as well as the lag in acceptance by schools of the concept that these libraries, however good, cannot be self-sufficient. He observes that "the idea of networking has thus far tended to be an informal kind of arrangement to get something from somebody else who happens to have it, rather than making a concerted effort to develop a systematic way of transferring materials and finding out what others have, reaching beyond the building level for the resources that are needed." (p. 67)

CRITERIA FOR NETWORKING

Becker and Olsen (5), as cited by Shank (31), identify four characteristics of an ideal network:

> (1) Formal Organization. Many units sharing a common information purpose recognize the value of group affiliation and enter into a compact.
>
> (2) Communications. The network includes circuits that rapidly interconnect dispersed points.
>
> (3) Bi-directional Operation. Information may move in either direction, and provision is made for each network participant to send as well as receive.
>
> (4) A Directory and Switching Capability. A directory look-up system enables a participant to identify the unit most able to satisfy a particular request. A switching center then routes messages to the unit over the optimum communications path. (pp. 290-91)

Purdy (27) identifies "some major conditions of successful interlibrary cooperation between libraries with differing missions and different clienteles," including: (1) "the attitude of the people involved," (2) "the reciprocity requirement": the desire and need for equity, a concept which is challenged by DeJohn (10), (3) the need for formal machinery, "ideally involving something in the nature of a secretariat," (4) the value of propinquity, (5) the imperative for sound planning, and (6) the need for funds to stimulate and implement cooperative programs. (pp. 114-15)

Wilkins (32), in describing the cooperative program of the Rockland Community College and the Rockland County Board of Cooperative Educational Services, Suffern, New York, reports: "We have learned that supervision must be by a single authority who is responsible for all operating decisions. That supervisor is subject, in turn, to the policy constraints of the cooperating agencies." (p. 18)

Schwartz (30) emphasizes the criterion of responsiveness to identified user needs, calling attention to the findings of the NCLIS conference on user needs held in Denver in May 1973: For all user groups whose needs were analyzed, "two factors which remained consistent were the importance of time and the usability of format." (p. 221)

BARRIERS TO COOPERATION

There is widespread agreement in the literature that the major obstacle to participation in networks lies in the attitudes of librarians, as well as the attitudes of (some) library users. Fetterman (14) states the case emphatically: "It is critical at this point to face the issue head-on. The obstacles to resource sharing are no longer inherent in technology, but in people." (p. 12)

Barriers to cooperation identified by participants in a series of meetings sponsored by the American Library Association in 1968, originally summarized by Nolting (25), are quoted in Fetterman's survey of the rationale for resource sharing (14):

> (1) Psychological barriers--fear of loss of local autonomy, clash of personalities, inertia and indifference, unwillingness to experiment, etc.
>
> (2) Lack of information and experience--lack of knowledge of the needs of users, unpredictability of demands on the library by its legitimate users, failure of small libraries to realize the value of resources of larger cooperative efforts in other states
>
> (3) Traditional and historical barriers--lack of adequate funds, fear of large libraries of being overused and undercompensated, inadequacy of libraries to serve their own needs, limitations on access to academic and special libraries, institutional competition between school and public libraries
>
> (4) Physical and geographical barriers--distance between libraries and distance of users from libraries, difference in size of collections, lack of space in public libraries to serve students, delays in satisfying needs and requests of users
>
> (5) Legal and administrative barriers--too many governmental units, lack of communication across jurisdictional lines, lack of bibliographical tools and controls, incompatibility of equipment and procedures and rules between libraries, lack of properly trained staff, lack of appropriate state-enabling legislation, lack of creative administrative leadership, etc. (pp. 13-14)

Among the barriers listed in this summary, Schwartz (30) underscores the gaps in knowledge of user needs; Franckowiak (15) calls attention to the prevailing failure to accept the student as a full citizen, with equal right to resources and services, as well as the lack of adequate community and state-level coordination.

Drescher's analysis (13) of school library cooperation in ILLINET identifies similar barriers to full school participation in this state network. Comparable statements were made by state library agency staff who responded to Woolls' survey (33). The lack of strong leadership and initiative by state agencies is scored in a recent report on the failure of efforts to achieve state-wide cooperation in Hawaii (20).

RECOMMENDATIONS

It is apparent, indeed, that school libraries lag behind other types of libraries in the extent of their participation in networking activities.

Franckowiak's earlier position paper (15) presents a set of cogent basic recommendations that merit further consideration by the National Commission and its Task Force on the Role of the School Library Media Program in Networking.

The writers offer the following recommendations for Task Force efforts:

(1) A concerted effort should be made to identify networking activities not reported in the existing literature.

(2) Existing networks should be surveyed, wherever possible, to collect baseline data. The model described by Montgomery (23) could be used or adapted for this purpose, in order to obtain consistent information on network examples. Few cases were found in which the literature provided more than cursory descriptions of networking activities; still fewer descriptions included critical analysis of the network's effectiveness. Direct query appears to be necessary to obtain baseline information on operating networks, and may serve also to screen out those in which school library participation is largely theoretical rather than real.

(3) Consideration should be given to a real attempt to evaluate representative networking programs. Various possibilities may be considered for such a project: evaluation conducted by NCLIS Task Force members; cooperation with AASL and its Committee on Networking; research by library school faculty/ students; co-sponsorship of funded research; and employment of contractual services.

(4) Efforts should be made to encourage publication of information needed to extend awareness of, interest in, support for, and knowledge about the role of school media programs in networking, with school media personnel as the primary audience. The forthcoming (Fall 1977) issue of School Media Quarterly offers an example of what is needed. Information obtained by further efforts to identify and survey existing networks should be available to support both "awareness" and more formal continuing education efforts, discussed below. More "how-to" information on technology and on essential elements in planning, addressed to the grass roots level, is needed to combat attitudinal barriers.

(5) Priority should be given to a broadly based "awareness" program addressed to professional school media personnel at individual school, district, regional, and state levels, to create/extend awareness of and arouse interest in the potential of networking activities.

Activities suggested above for provision of information should support such an "awareness" program.

Consideration should be given also to the need for interpreting to librarians in other types of libraries the contributions offered by school library participation in networks.

(6) Major emphasis should be given to the identification of particular needs, funding sources, sponsoring groups, and design of in-service education opportunities for school media personnel.

In-service education programs, broadly construed, are essential to such goals as acceptance of the concept that no single library can be self-sufficient; recognition of the reciprocal contributions of networking; understanding of characteristics of effective networks; knowledge of essential technological capabilities and organizational features; and competency in analyzing users' needs and in systematic planning.

Consideration of delivery systems for continuing education programs should take into account the levels at which in-service education activities are needed (national, interstate, state, region, district, community); agencies which can participate in the provision of such activities (e.g., professional associations, state education and library agencies, regional centers, districts and communities, library education programs); and sources of support which may be tapped to support design and implementation of continuing education programs. Recognition should be given to the need (both real and symbolic) for library cooperation among types of libraries in continuing education.

Information may be obtained from review of efforts such as the ISAD/AASL regional workshops on school library automation, ERIC workshops, the MaRC project institutes for participating library staffs, and the Cataloging in Publication (CIP) workshops cosponsored by the Association of American Publishers and the Library of Congress. The role of CLENE should be considered.

The NCLIS study of the feasibility and desirable characteristics of a national data base for nonprint materials has clear and important implications for school library networking. Findings of this study may provide an effective vehicle for continuing education programs.

Possible approaches for the NCLIS Task Force on the Role of the School Library Media Program in Networking include the development of guidelines for planning in-service programs on school library participation in networking; identification of program resources (human and material); and exploration of sources of funding and planning support for continuing education programs.

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ELIMINATION OF REDUNDANCY IN KEYBOARDING BIBLIOGRAPHIC DATA FOR COMPUTER-BASED INFORMATION SYSTEMS

Theodore C. Hines

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Our basic input configuration is intended primarily for format recognition: all fields are variable, and there is minimal explicit tagging. Data elements are recognized and identified mainly by their spacing, position, and significant internal characteristics.

Some minor editing is done by the keyboard operator to permit computer filing by use of a very simple sortkey generator - omission of initial articles from titles, for example - to conform to a filing code developed earlier.

Basically, the input format is the same as that used for catalog entries for many years: author, title, imprint, and collation in that order. Annotations, notes, contents notes, and tracings follow. The differences arise in the way in which some data elements are recorded, permitting others to be omitted. Space does not permit the discussion of all of these and of the many possible variations, but we can indicate some of the most important ones.

1) Author field. In cases of multiple authorship in conventional cataloging, the primary author is given as main entry, and added entries are usually made for the others. All of the names are repeated in the title field. In our format, all authors are entered in the author field, with the names in inverted form and separated by semicolons. Both added entries and an author statement for the title field are generated by program. Example: ALDRIDGE, JOSEPHINE HASKELL; ALDRIDGE, RICHARD

2) Title field. The title is so punctuated as to permit format recognition of title proper, sub- or alternate title, and the remainder

Elimination of Redundancy in Keyboarding Bibliographic Data for Computer-Based Information Systems

Abstract.- An input design for keyboarding bibliographic data developed earlier has been expanded for use in recording data on school media center materials at the University of North Carolina at Greensboro. The input design depends on format recognition of variable length fields with minimal explicit tagging. Pre-editing of existing catalog card copy is not required. Verification is easily accomplished from an output program which explicitly tags data elements. Considerable keyboarding savings are achieved through elimination of the obvious redundancies common in cataloging entries, and by making maximum use of a program to develop added entries and other tracings or access points without information loss. Rough comparisons with the keying required to produce a conventional manual unit card catalog record for the same type of data indicate keyboarding savings of 20-30%. Good input design can be developed for easy keyboarding and proofreading which also provides substantial savings in keystrokes.

At the University of North Carolina at Greensboro, the Library Science/Educational Technology Division of the School of Education has been studying the application of library automation and information science techniques to school media center materials.

In a number of instances, and for a number of different media, we have been forced to do our own input keyboarding. Input keyboarding is one of the most expensive aspects of any computer-based information system. This paper reports on one aspect of the input design concepts which we have developed, that of lowering input costs by reducing redundancy in the keyboarding of bibliographic data.

In order to provide a basis for comparison, this paper compares our input design with the keying requirements for the same basic information as keyed in conventional library unit card format for a card catalog. We have followed the more usual forms used before ISBD. We recognize that in many instances it would be desirable to be able to derive a MARC format from input, and to include ISBD data elements, punctuation, and spacing. Often, however, this is not economical, useful, or practicable. In these cases our principles of input design may be of value to others.

of the title statement. If there is an illustration or editorial attribution, it forms a separate data element, with name or names inverted. The format recognition program puts the names in normal order for the output title statement, and creates added entries for the names.

3) Collation. The collation statement is relatively conventional, although we may add here such additional information as reading level and price. Series (if any) appears as the last data element of the collation, permitting series added entries to be made by the program.

4) Contents notes. Contents notes are tagged 'CN: ' or 'CON: ' on input. 'CON: ' distinguishes those notes which give title or author and title for composite works. This permits the recognition program to form analytic author/title and title/author tracings. Names are keyed in inverted form, and can be regularized by program for the output contents note. Both tags may be expanded to 'CONTENTS.- ' on output, just as our abbreviation 'AN: ' can be expanded to 'ANNOTATION.- ' by program.

5) Tracings. Tracings which will not be program generated are keyed. Since the vast majority of these will be added entries, the usual number tags need not be keyed before topical subjects, but only before such few other added entries as may be keyed. Actually, our recognition program does not number any added entries, but rather tags each with a letter designation to indicate type: added author, other association, series, analytic. Topical subject headings are not tagged by program. No added entry is made for title, since the program has tagged the title proper separately from the rest of the title statement.

Some examples of input are given below:

EXAMPLE 1

ALDRIDGE, JOSEPHINE HASKELL; ALDRIDGE, RICHARD
REASONS AND RAISINS. IL BY LARRECQ, JOHN PARNASSUS
PRESS; 1972. N. P. COL IL LC: 72-156875 PH-3 N-P-4
$3.87

AN: LITTLE FOX STEALS HIS MOTHER'S RAISINS AND GOES OFF FOR ADVENTURE WITH A CROW, A CIRCUS FAT LADY, A MAGICIAN AND A MASKED WEASEL. ALONG THE WAY HE LEARNS A LESSON ABOUT THE DIFFERENCE BETWEEN THE WAY THINGS ARE AND THE WAY THEY SEEM TO BE.

OBEDIENCE - FICTION
FOXES - STORIES
IMAGINATION - FICTION

CHILD STUDY ASSOCIATION OF AMERICA. NOW YOU CAN READ TO YOURSELF; EASY-TO-READ STORIES. IL BY BURCHARD, PETER
CROWELL; 1964. 132 P. IL LC: 64-22540 PH-2 P-2
$2.96

AN: A COLLECTION OF ELEVEN LIVELY, FUNNY AND SURPRISING STORIES.

CON: OLDS, H. D. SILVER BUTTON; FLACK, M. TIM TADPOLE; MOORE, L. TOO MANY BOZOS; ANDERSON, C. W. LONESOME LITTLE COLT; BELL, G. ANDY AND MR. WAGNER; CASTLE, J. PEEP-LO; LIEBERS, R. AND ROTHENBERG, L. STEVIE FINDS A WAY; COLLIER, E. I KNOW A FARM; ASHERON, S. SURPRISE IN A TREE; KRASILOVSKY, P. BENNY'S FLAG; BRANLEY, F. M. WHAT THE MOON IS LIKE.

SHORT STORIES
LITERATURE - COLLECTIONS

BENCHLEY, NATHANIEL STRANGE DISAPPEARANCE OF ARTHUR CLUCK. PICTURES BY LOBEL, ARNOLD HARPER & ROW; 1967.
64 P. COL IL LC: 67-4L5L PH-1 N-P-2 $3.14 (I CAN READ MYSTERY)

AN: RALPH, THE WISE OLD BARN OWL, ENCOUNTERS MANY NIGHT CREATURES AS HE HELPS WORRIED MRS. CLUCK SEARCH FOR HER MISSING SON ARTHUR. YOUNG ARTHUR'S ABILITY TO PERFORM AN UNUSUAL TRICK HELPS SOLVE THE MYSTERY OF HIS DISAPPEARANCE.

MYSTERY AND DETECTIVE STORIES
ANIMALS - STORIES

The following examples shows tagging by program:

EXAMPLE 2

```
AUTHOR: ALDRIDGE, JOSEPHINE HASKELL
AUTHOR STATEMENT: BY JOSEPHINE HASKELL ALDRIDGE AND RICHARD
ALDRIDGE.
TITLE: REASONS AND RAISINS
TITLE STATEMENT: IL BY LARRECQ, JOHN
IMPRINT: PARNASSUS PRESS; 1972.
COLLATION: N. P.  COL  IL  LC: 72-156875  PH-3 N-P-4  $3.87
LC NUMBER: 72-156875
ANNOTATION: LITTLE FOX STEALS HIS MOTHER'S RAISINS AND GOES
OFF FOR ADVENTURE WITH A CROW, A CIRCUS FAT LADY, A MAGICIAN
AND A MASKED WEASEL.  ALONG THE WAY HE LEARNS A LESSON ABOUT
THE DIFFERENCE BETWEEN THE WAY THINGS ARE AND THE WAY THEY
SEEM TO BE.
A: LARRECQ, JOHN
A: ALDRIDGE, RICHARD
OBEDIENCE - FICTION
FOXES - STORIES
IMAGINATION - FICTION


AUTHOR: CHILD STUDY ASSOCIATION OF AMERICA.
TITLE: NOW YOU CAN READ TO YOURSELF
TITLE STATEMENT: EASY-TO-READ STORIES.  IL BY BURCHARD, PETER
IMPRINT: CROWELL; 1964.
COLLATION: 132 P.  IL  LC: 64-22540  PH-2 P-2  $2.96
LC NUMBER: 64-22540
ANNOTATION: A COLLECTION OF ELEVEN LIVELY, FUNNY AND SURPRISING
STORIES.
CONTENTS: OLDS, H. D.  SILVER BUTTON; FLACK, M.  TIM TADPOLE;
MOORE, L.  TOO MANY BOZOS; ANDERSON, C. W.  LONESOME LITTLE
COLT; BELL, G.  ANDY AND MR. WAGNER; CASTLE, J.  PEEP-LO;
LIEBERS, R. AND ROTHENBERG, L.  STEVIE FINDS A WAY; COLLIER,
E.  I KNOW A FARM; ASHERON, S.  SURPRISE IN THE TREE;
KRASILOVSKY, P.  BENNY'S FLAG; BRANLEY, F. M.  WHAT THE
MOON IS LIKE.
A: BURCHARD, PETER
SHORT STORIES
LITERATURE - COLLECTIONS
CN: SILVER BUTTON  OLDS, H. D.
CN: OLDS, H. D.  SILVER BUTTON
CN: TIM TADPOLE  FLACK, M.
CN: FLACK, M.  TIM TADPOLE
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CN: TOO MANY BOZOS  MOORE, L.
CN: MOORE, L.  TOO MANY BOZOS
CN: LONESOME LITTLE COLT  ANDERSON, C. W.
CN: ANDERSON, C. W.  LONESOME LITTLE COLT
CN: ANDY AND MR. WAGNER  BELL, G.
CN: BELL, G.  ANDY AND MR. WAGNER
CN: PEEP-LO  CASTLE, J.
CN: CASTLE, J.  PEEP-LO
CN: STEVIE FINDS A WAY  LIEBERS, R. AND ROTHENBERG, L.
CN: LIEBERS, R. AND ROTHENBERG, L.  STEVIE FINDS A WAY
CN: I KNOW A FARM  COLLIER, E.
CN: COLLIER, E.  I KNOW A FARM
CN: SURPRISE IN THE TREE  ASHERON, S.
CN: ASHERON, S.  SURPRISE IN THE TREE
CN: BENNY'S FLAG  KRASILOVSKY, P.
CN: KRASILOVSKY, P.  BENNY'S FLAG
CN: WHAT THE MOON IS LIKE.  BRANLEY, F. M.
CN: BRANLEY, F. M.  WHAT THE MOON IS LIKE.
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```
AUTHOR: BENCHLEY, NATHANIEL
TITLE: STRANGE DISAPPEARANCE OF ARTHUR CLUCK
TITLE STATEMENT: PICTURES BY LOBEL, ARNOLD
IMPRINT: HARPER & ROW; 1967.
COLLATION: 64 P.  COL  IL  LC: 67-4151  PH-1 N-P-2  $3.14
(I CAN READ MYSTERY)
SERIES: I CAN READ MYSTERY
LC NUMBER: 67-4151
ANNOTATION: RALPH, THE WISE OLD BARN OWL, ENCOUNTERS MANY
NIGHT CREATURES AS HE HELPS WORRIED MRS. CLUCK SEARCH FOR
HER MISSING SON ARTHUR.  YOUNG ARTHUR'S ABILITY TO PERFORM
AN UNUSUAL TRICK HELPS SOLVE THE MYSTERY OF HIS DISAPPEARANCE.
A: LOBEL, ARNOLD
MYSTERY AND DETECTIVE STORIES
ANIMALS - STORIES
```

In working out these techniques we have been astonished by the amount of redundancy in the usual catalog card unit card format which can be eliminated in a computer-based system without information loss. Even it we drop from consideration the author/title and title/author analytics as not usually made (though they are an important information gain), these include elimination of:

1) Repetition of author names, often given in three places on the card: author statement, title statement, and tracings.

2) Repetition of other name added entries in the title statement and tracings.

3) Title tracing for the vast majority of titles. Parenthetically, it might be wondered why conventional cataloging did not use the tracing 'No title' for titles not to be traced as being far more economic than the reverse procedure.

4) Series tracing for a significant proportion of series.

5) Numbering of tracings. This numbering is not a redundancy *per se*. However, the computer-based system permits elimination of numbers in keyboarding, though type tagging may be necessary for occasional added entries.

Obviously, series entries for publisher's series are often not desired. This may be dealt with either by not giving them in the collation, tagging them in the collation to indicate that they should be suppressed, or listing series entries not to be computer-generated on a stoplist.

Similar procedures can be applied to non-significant title roots such as 'Textbook of', 'History of' and so on. Actually, titles become really 'non-destructive' in increasing numbers as the size of the data base increases, so that the flexibility of listing roots for suppression is an information advantage.

We have been pleasantly surprised to find that no pre-editing of normal catalog copy is required for our input keyboarding: the editing can be done quite successfully as the keying is done.

Example 1 shows several types of entries keyed in the input format a printed out line-for-line. As they stand, they are not too very different in general appearance from more conventional typed bibliographic citations, and would not be too difficult to proofread in this form. The major noticable differences are the inclusion of multiple names in the author statement, the inversion of names in the title statement, the omission of numbers on tracings, and occasional odd spacing at the beginnings of lines. The latter is not a necessary consequence of the format, but reflects some extra convenience in line layout for the keyboarder.

Actually, proofreading is done from an output format like that shown in Example 2, which also illustrates the program's capability for tagging types of data. This capability provides for great flexibility in possible forms of output, ranging from simple main entry lists to lists with indexes or to dictionary catalogs. Class numbers do not appear in the examples only because the data set from which they are drawn is composed entirely of picture books and easy material in all media for young children. The input format itself has provisions for a much broader range of data elements than appears in the example, including place of publication, subject analytics, abstracts, index entries, journal citations, and the like.

EXAMPLE 3

ALDRIDGE, JOSEPHINE HASKELL

REASONS AND RAISINS, BY JOSEPHINE ALDRIDGE AND RICHARD ALDRIDGE. ILLUSTRATED BY JOHN LARREQ. BERKELEY, CAL., PARNASSUS PRESS, 1972.

N.P. COL. IL. 21 CM. LC: 72-156375 $3.87

LITTLE FOX STEALS HIS MOTHER'S RAISINS AND GOES OFF FOR ADVENTURE WITH A CROW, A CIRCUS FAT LADY, A MAGICIAN AND A MASKED WEASEL. ALONG THE WAY HE LEARNS A LESSON ABOUT THE DIFFERENCE BETWEEN THE WAY THINGS ARE AND THE WAY THEY SEEM TO BE.

1. OBEDIENCE - FICTION 2. FOXES - STORIES 3. IMAGINATION - FICTION I. TITLE II. ALDRIDGE, RICHARD III. LARREQ, JOHN

CHILD STUDY ASSOCIATION OF AMERICA

NOW YOU CAN READ TO YOURSELF; EASY-TO-READ STORIES; SELECTED BY THE CHILD STUDY ASSOCIATION OF AMERICA. ILLUSTRATED BY PETER BURCHARD. NEW YORK, CROWELL, 1964.

132 P. IL. 22 CM. LC: 64-22540 $2.96

A COLLECTION OF ELEVEN LIVELY, FUNNY AND SURPRISING STORIES.

CONTENTS.- SILVER BUTTON BY H. D. OLDS, TIM TADPOLE BY M. FLACK, TOO MANY BOZOS BY L. MOORE, LONESOME LITTLE COLT BY C. W. ANDERSON, ANDY AND MR. WAGNER BY G. BELL, PEEP-LO BY J. CASTLE, STEVIE FINDS A WAY BY R. LIEBERS AND L. ROTHENBERG, I KNOW A FARM BY E. COLLIER, SURPRISE IN A TREE BY S. ASHERON, BENNY'S FLAG BY P. KRASILOVSKY, WHAT THE MOON IS LIKE BY F. M. BRANLEY

1. SHORT STORIES 2. LITERATURE - COLLECTIONS I. TITLE II. BURCHARD, PETER

```
BENCHLEY, NATHANIEL
    THE STRANGE DISAPPEARANCE OF ARTHUR CLUCK.  STORY BY
NATHANIEL BENCHLEY.  PICTURES BY ARNOLD LOBEL.  NEW YORK,
HARPER & ROW, 1967.
    64 P.  COL.  IL.  23 CM.  LC: 67-4151  $3.14  (AN I CAN
READ MYSTERY)
    RALPH, THE WISE OLD BARN OWL, ENCOUNTERS MANY NIGHT
CREATURES AS HE HELPS WORRIED MRS. CLUCK SEARCH FOR HER
MISSING SON ARTHUR.  YOUNG ARTHUR'S ABILITY TO PERFORM AN
UNUSUAL TRICK HELPS SOLVE THE MYSTERY OF HIS DISAPPEARANCE.
    1.  MYSTERY AND DETECTIVE STORIES  2.  ANIMALS - STORIES
I.  TITLE  II.  LOBEL, ARNOLD
```

Example 3 shows some of the citations from a small sample of entries which we also keyed in regular unit card format in order to compare the number of keystrokes required as compared to our input format. The figures are only indicative, not statistically reliable, since the sample consisted of only ten entries, and since these were chosen to illustrate diversity of content rather than to be a representative sample.

Nonetheless, the figures are interesting. Including annotations, the unit card format required 5,569 keystrokes as compared to 4,395 keystrokes for format recognition input, a difference of 1,174 keystrokes, or a reduction of about 20%. This difference is even more striking, amounting to 30% if we consider only citations proper, and eliminate the keystrokes required for the annotations in both examples. The respective totals in this case are 3,631 and 2,457.

These examples of format recognition input do not, of course, represent any ultimate in efficiency. They do show, however, that good input design can be made easy to key and proofread while at the same time reducing the keying of redundant information without any information loss in output. The concepts and techniques outlined are applicable very broadly to computer-based systems.

Bibliographic Note

Other aspects of this input format at various developmental stages and in relation to various applications have been discussed elsewhere:

Harris, Jessica Lee, and Hines, Theodore C. "Computer-Produced Course Bibliography." *Journal of Educational Librarianship* II (Fall 1970): 137-45.

Harris, Jessica L.; Hines, Theodore C.; and Scott, Ralph L. "A Computer-Based Census and Local Handlist System for Incunabula." *Computers and the Humanities* 6 (November 1971): 95-102.

Hines, Theodore C., and Harris, Jessica L. *Computer Filing of Bibliographic, Catalog, and Index Entries*. Newark, N. J.: Bro-Dart Foundation, 1966.

About the Authors

Dr. Theodore C. Hines is principal investigator. Jane Martin and Jerry Warren are Research Associates in the development of a children's materials data base.

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SUBJECT HEADINGS FOR CHILDREN'S MATERIALS
A Working Paper

Since last April, the Library Science/Educational Technology Division has been doing extensive work and experimentation with the subject headings and cross-references used in the subject index of The Elementary School Library Collection, 9th edition, edited by Phyllis Van Orden and published by the Bro-Dart Foundation in 1974.

This selective, evaluative listing of materials in many media is representative of an excellent, fairly large school or public library collection for the elementary grades. Similarly, since the subject cataloging follows either Sears or the Library of Congress AC cataloging, the headings represent good current cataloging practice.

While there has been considerable study of subject heading lists for both adult and juvenile materials, little if any work appears to have been done on the analysis of headings as actually assigned to a good collection of children's materials in all media, so that we would appear to be breaking new ground in this respect.

Our project, made possible by a generous grant from Brodart, has a number of purposes. The four basic ones are:

1) To develop sub-listings of headings and references in particular topical areas, or for particular forms of materials, which will be useful reference aids for children, teachers, librarians, and parents. A sample of such a listing, covering headings relating to American Indians, is attached.

2) To explore the degree to which a combination of traditional subject heading list practice, information science techniques for thesaurus production, and additional computer manipulation of entries could produce a more satisfactory working tool for librarians and library users than the current Sears or Library of Congress heading lists.

3) To study the nature of good existing subject heading practice as applied to an excellent collection of children's materials in order to suggest improvements.

4) To determine needs for the publication of materials in subject or other areas not adequately represented at present.

The Elementary School Library Collection includes 9,913 different titles. The subject index provides 9,361 access points - subjects, subjects with subdivisions, and SEE or SEE ALSO cross-references. These 9,361 entries have been keyboarded and stored on disk. Personal names were tagged with an asterisk on input to make machine recognition of them by program possible.

Where direct geographic subdivisions were used, we supplied the indirect subdivision between less than and greater than signs; e.g.

PHYSICAL GEOGRAPHY - <EUROPE> - SPAIN

Actually, there were very few such subdivisions, leading us to wonder whether an indirect approach to headings proper, such as

<ITALY> - FLORENCE - SOCIAL LIFE AND CUSTOMS

would not be even more valuable than the resumption of indirect subdivision (useful though that is) which LC is now implementing. We are aware of the geographic coding in the MaRC record, but this is of little value, at least at present, to smaller libraries and their users.

All other data elements in the headings we have keyed (subjects proper, subdivisions, parenthetical qualifiers, SEE and SEE ALSO references) can be program identified by examination of content or by the implicit tagging provided by the styling of the input.

Our work with these headings is very far from complete. For one thing, each question answered seems to pose new questions we would like to have answered. In addition, staff resources are limited and our working time has been brief.

The ALA meeting, however, does provide an opportunity for us to present what has been done so far and an indication of what we plan to do, and to solicit comments, suggestions, and constructive criticism to help us as we proceed.

Some overall figures may be of interest at this point. The 9,913 titles in the ESLC list include 400 professional materials for librarians and teachers, and 200 reference books. There are 7,529 juvenile non-reference book titles. 1,701 different non-print titles in a wide variety of media are covered, including games, maps, kits, and pictures. About the only widely-used medium not covered is 16 mm film.

It has been noted that 9,361 different access points are provided in the subject index to the collection. This includes 599 personal name subjects or subjects with subdivisions for 566 different persons. There are 12 SEE references to these names and one SEE ALSO.

The remaining 8,749 entries many be broadly divided as follows;

Subjects and subjects with subdivisions		5,569
SEE references	821	
SEE ALSO references	2,359	
Total syndetics		3,180

Out of this total, there are only 3,032 different subject headings proper, and this includes name entries other than personal names. We have not yet made a count of how many different subdivisions are used, or of such other general factual information as how mny subject headings proper appear only with subdivisions (i.e., have no entries to which the subject heading standing alone would apply), or how often multiple subdivisions of a heading occur, or how many headings or subdivisions have x many words. We do intend to make such counts, as well as a number of others, to obtain more basic information about the entries.

Despite the fact that we have much more analysis to do, we have gathered a good deal more data than appears above. This has come about because we were interested in pulling out and working with useful sub-listings, and because we are examining some subgroups of headings for grammatical and other characteristics.

It may be of some interest to know, for example, that 'FICTION' is used as a subdivision of 1,148 different headings, and 'STORIES' for a further 174. There are 204 entries containing the word 'POETRY' as a subdivision or in the heading proper, and 216 with the word 'CHILDREN'. Searching for 'MUSIC' or 'SONG' or 'ORCH', we pulled out 204 headings or references relating to music. In regard to geographic and cultural studies, it is worth remarking that 'SOCIAL LIFE AND CUSTOMES' is used to subdivide 120 different names of areas, countries, or groups.

From the point of view of grammar or punctuation, we found 70 entries (excluding personal names) containing apostrophes. There were 32 subjects proper which were 'AS' phrases, 21 of these 'AS A PROFESSION'. Again excluding personal names, 374 entries included periods, a very significant (but uncounted) proportion occurring in the initials 'U. S.' Some 212 entries included numerals, almost all of them being dates. There were 957 entries containing phrases with the conjunction 'AND', most of them simple three word phrases. Forty-two entries included that delightfully vague abbreviation 'ETC.' 'IN' phrases totalled 190, 50 being 'IN THE' phrases, mainly 'IN THE U. S.' The preposition 'OF' appeared in 266 entries, including 27 personal names in this instance.

Parenthetical qualifiers appear in only 204 headings. Once personal names are excluded, commas appear in 549 entries. For purposes of further analysis, we need counts of simple inversions, series, and separate counts of headings proper with commas and of subdivisions with commas.

We are just at the beginning of our analysis of syndetics. Preliminary examination of the SEE references, excluding the 12 which refer to personal names, indicates that there are only 9 general references: that is, entries which refer not to a particular heading or headings but rather to groups or classes of headings; e.g. 'FOOTBALL CLUBS SEE NAMES OF INDIVIDUAL CLUBS, E. G. GREEN BAY PACKERS, ETC.'

Of the total of 821 SEE references, only about 100 to 150 represent accesspoints which could be automatically generated by our computer programs, which permute or otherwise manipulate entries to provide such references. However, our observations indicate that many more such references would be useful.

We have only just begun the manual sorting of SEE ALSO references into broader term (yes, there are a few), narrower term, related term, and general groups. We feel that this will be quite useful in enabling us later to make lists of the hierarchies implies by the SEE ALSO references - lists Cutter noted would be desirable, but felt would be too expensive to make. They are common in thesauri, but thesauri usually have a much less complex syndetic structure.

Just as we have begun manual sorting of SEE and SEE ALSO references into useful groups, we have also recorded (but not yet keyboarded) the frequency of use of each heading or heading and subdivision and the Dewey numbers most frequently associated with each. We expect both data elements to be most useful: the first, among other things, to help eliminate some nonce terms from any published heading list; the second as a guide to the shelves, a kind of scope note, and despite the existence of disapproval of this kind of approach, a guide to classification and to the classification scheme itself. Recording frequency will also permit us to print out and study a rank frequency list of headings by times assigned. We are not sure what this will show, but believe that it will prove interesting.

Rumor says that the new Sears list will restore Dewey numbers. Let it be so. In our case, recording Dewey numbers will permit us, following thesaurus techniques but expanding on them, to print out a lost of the headings associated with particular Dewey numbers in Dewey number order. We think this counld be quite a useful tool.

Some time ago, I did quite extensive work with the concept of using computer techniques to augment cross-referencing of the Library of Congress headings list, and did preliminary work on the application of information science thesaurus techniques to this list.

Later, Edwin B. Brownrigg and I did an indexing vocabulary for a newspaper morgue based on these ideas. Because we could control the form of the headings in this instance, we could adhere to the general format of LC headings, but introduce more regularization and additional features, from consistent use of indirect geographic entry to introducing uniform use of certain parenthetical qualifiers (ANIMALS, ANATOMY AND PHYSIOLOGY) whether they were required to distinguish homographs or not. We could also regularize such 'AND' phrases as 'NATIONAL PARKS AND RESERVES' to 'NATIONAL PARKS AND NATIONAL RESERVES' which made them much more easily handled by computer to produce useful cross-references automatically.

As a result of this work, we have been applying similar techniques to the headings in the ESLC collection. We have found that a very few simple rules can produce a variety of valuable references automatically, and that relatively few changes in headings, or augmentation of headings, can greatly increase access possibilities. Using these techniques will not cause nearly the increase in bulk in a heading list as might be anticipated, because their reverses need not be given in the list - the cataloger can simply assume they have been made. Combined with thesaurus techniques for handling related term entries - which cuts the space required for them in half - these methods can greatly increase usefulness without great increases in bulk. In addition, using the computer assures that the computer-generated entries will be absolutely consistent.

The computer cross-referencing structure we suggest is quite simple. It also permits additions or changes in the heading list to provide extra access whether not these are actually reflected in the final catalog itself - hence, without requiring LC to change - by using minimal input additions or tagging, adding, for example the qualifier ANIMALS to all animal names in the following way:

OTTERS ‹ANIMALS›

and treating geographic entries as indicated on page 2.

The actual manipulations of entries we are using so far are quite simple:

1) A reference is made from each use of a subdivision to the heading it is used to subdivide. PIGS - POETRY produces

POETRY SUBDIVIDES PIGS

2) Similar references from the use of each qualifier, so that CRANES (BIRDS) produces

BIRDS QUALIFIES CRANES

3) References, by inversion or re-inverting, from every significant word (word not on a stoplist) in every heading, SEE reference, qualifier, or subdivision entry, with the following exceptions:

a) "IN', 'IN THE', 'OF', 'OF THE', and 'AS' phrases become object followed by subdivision; e.g.

CHILDREN IN ASIA become
ASIA - CHILDREN SEE CHILDREN IN ASIA

except that MEDICINE AS A PROFESSION and similar phrases become:

PROFESSIONS - MEDICINE   SEE MEDICINE AS A PROFESSION

b) 'AND' phrases consisting of only three words have the reference made from the second word standing alone; e.g., STUDY AND TEACHING produces

TEACHING   SEE STUDY AND TEACHING

c) Entries containing only one comma are considered to be inversions. References are made to them from the normal order and from every possible inversion except the original one.

We are considerating a number of heading modifications. For example, consistent modification of 'AND' headings would permit each part of the phrase on each side of the conjunction to be manipulated separately; e.g., CHRISTIAN ART AND SYMBOLISM would be entered CHRISTIAN ART AND <> SYMBOLISM to produce:

ART, CHRISTIAN   SEE . . .
CHRISTIAN SYMBOLISM   SEE . . .
SYMBOLISM, CHRISTIAN   SEE . . .

Similarly, CITY AND TOWN LIFE would be entered CITY <> AND TOWN LIFE, producing

LIFE, CITY   SEE CITY AND TOWN LIFE
TOWN LIFE   SEE . . .
LIFE, TOWN   SEE . . .

It is interesting that our earlier work on the LC list had (required) many more manipulations than appear to be needed for the headings applied to a restricted list of titles like those of the ESLC.

Working with The Elementary School Library Collection headings is providing a whole new perspective as far as suggesting ideas for heading modification and issuing a new list of headings for children's materials and for smaller public libraries is concerned. The universe is finite enough and the market large enough to use thesaurus techniques and computer augmentation to provide many more access points and supplemental lists. Heading modernization for juvenile materials is fairly far advanced by LC, and no reason exists why this cannot be done on a very large scale for juvenile (AC) headings, nor why the form of some types of headings cannot be altered to be more consistent or to allow computer manipulation to produce classed lists of headings in particular areas, even if the latter is restricted in application to the lists alone rather than to headings as they appear in the catalog.

In a sense, because the headings actually applied to juvenile titles do represent such a small universe, all kinds of opportunities are before us. If we restrict each edition of our subject heading list to new headings and the headings actually used on subjectively good and useful titles still in print, the number of headings is small enough to permit us to include, explicitly, all of the used headings for place names, personal names, animals, and the like in the printed list itself, together with all the broader term and narrower term references to and from them. We can affort heavily to increase both human and computer-produced cross-referencing.

Based upon what we have been doing and the earlier work with Brownrigg and others, let us romanticize a bit. It would be economically practical right now to produce and to sell for a profit a new, computer-produced fairly bulky heading list for children's materials and small public libraries which included a list of used headings only; a list of headings arranged by Dewey number, including subdivisions; a list of subdivisions with notes; a main listing with references as described earlier; a list of all the hierarchies implied by the BT and NT references; and, presumably, additional specialized listings of headings related to areas of special interest: geographic, ethnic, national, music, etc.

We do not know how long it is since the Sears list was carefully checked against an actual working collection, but the compilation method we are proposing - that is, basing new editions of a list each time on such a good selective collection as the ESLC list - would assure that all headings were live and make revision of outdated heading expression quite simple. A list for working - as opposed to research and archival - collections could be current with modern terminology and useage without posing serious problems. Why not do this for the great bulk of libraries in this country, the major customers for LC cataloging, whose collections are mainly working collections? And what better place to begin than with materials for children, since this affects many more libraries by far than any alternative choice, and since currency and consistency of terminology and augmented access are so important here.

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Our thanks are due to George Bonsall, of Brodart, for his generous support. Substantial work on this project was done by the author, Edwin B. Brownrigg, Wilma Bates, Carol Walters, and Mary Frances Kendall Johnson. The support and advice of Lois Winkel and Mary Virginia Gaver are much appreciated.

COMPUTER-BASED PRODUCTION OF SCHOOL MEDIA CENTER REFERENCE TOOLS:

A WORKING PAPER

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OE Project
Working Paper

COMPUTER-BASED PRODUCTION OF SCHOOL MEDIA CENTER REFERENCE TOOLS: A WORKING PAPER

This working paper briefly and informally summarizes our discussions, observations, and conclusions on the production of a computer-based reference tool or tools as part of our OE project.

Speaking generally, computer-based production of any reference tool intended to go through successive editions with revisions of a part of the material would appear to be more economic than alternative means of production. The reasons why computer systems are not more widely used for this purpose than is the case at present are related more to the structure of the publishing and printing industry than to any economic or technical limitations.

In our approach to this area, we are assuming that we are concerned with tools useful to the school media center at the early childhood and elementary level, since this is the age group we are concentrating on at present.

We are also limiting the types of reference tools with which we will be concerned to bibliographic tools and indexes. It is in this area that we have access to staff with training and expertise. Our existing computer programs are adaptable to the production of these types of materials, and we already have a substantial base of machine-readable data with which to work.

We are also assuming that we will design the system so as to produce a tool which can be published by direct or photo-reduced offset from the computer printout, both in order to keep production costs low and to make it easier to secure a publisher. While quality graphic arts production from computer output is both feasible and economic, making provision for this would be difficult within the time limits we face, and would require programming effort not directly related to our basic goal of increasing information access.

Similarly, we have decided to use all capitals rather than upper-and-lower case output because of local cost factors in using upper-and-lower case, and for greater ease in keyboarding.

Keeping all of these factors in mind, it seems that we can develop a tool of high usefulness while still working within the framework described above. We have decided that this will be a guide derived from the application of our procedures for augmenting access to the early childhood materials already included in the data base we are developing.

The only similar tool currently in print was compiled by the Yonkers Public Library Children's Services. Entitled A Guide to Subjects and Concepts in Picture Book Form, it was published by Oceana in 1974. Excellent as far as it goes, it presents a relatively small number of subjects and concepts as compared to the combined approaches to the material which we have planned. In addition, it is limited to picture books available in the Yonkers collections.

In the tool we plan, we would try to include only titles which are in print and available. The scope would be considerably broader, including not only picture books but also easy books and all non-print media with the exception of 16 mm. film. And, as noted earlier, we will be providing far more in the way of classed subject access and access in relation to uses as well as topics of materials.

These early childhood materials are of the type where straight library subject cataloging is perhaps least useful. The topical subjects of the materials themselves are often diffuse, and there is considerable concern about identifying materials in which certain situations are depicted - sibling rivalry, or fear of the dark, for example - and for materials which may be used as part of a program to expand the child's horizons from home and family to peer group, school, and community.

The limitation of scope to in-print, recommended titles permits the index or guide to function as a primary selection tool as well as a finding aid. This can enhance efficiency in two ways: aiding school media people to have better collections as well as enhancing ability to locate suitable materials actually available on the spot.

Computer-based production would make relatively frequent new editions easy and economic. New titles may be added to the data base on a continuing basis, and the overall list checked to determine which titles have gone out-of-print or been superceded just before each edition run. The data bank format makes it relatively easy to change or add access points. Computer search capability helps to locate items for new headings and, if searches are offered as a service, the search records indicate access types which might be added to future editions. No rekeying of information valid from edition to edition is required.

In our discussions, we have become more and more aware that some bibliographic and index tools are much more immediately useful for local use in the school media center itself if they cover only in-print, selectively recommended titles. This is particularly true of analytical indexes, where the existing works tend either to cover titles issued during the period from edition to edition, thus requiring search of multiple alphabets and retrieving mainly titles not at all likely to be locally available; or cumulating into quite unwieldy lists with only the latter disadvantage.

A tool covering a core group of available titles, dropping out-of-print or superceded items from edition to edition, is much more valuable for use with local collections, permitting cumulations of the data to be used as a source for interloan information for material not locally available. At the moment, the professional literature seems to be providing the backup tool rather than the immediate working tool. Analytical indexes operating as proposed above should do much, too, to aid the selection process and produce better local collections. Better selection at the school media center level should also help to keep useful and valuable older titles in print.

Our discussions also distinguished a clear need for the production of a subject heading list built on thesaurus principles for elementary school collections. Each edition should be derived from headings actually assigned to a fairly full exemplar collection of available titles, include specific cross-references to the lowest level of the implied hierarchy of the syndetic structure, provide for display of the hierarchy, and include Dewey numbers and a classed list of headings. This will be discussed in detail in another working paper, as it seems to be a critical need as a finding aid as well as a cataloging tool.

In summary, our consideration of bibliographic and index reference tools for school media centers has led to several perhaps obvious but certainly important conclusions:

1) Computer-based production is the obvious way to improve tools and reduce costs.

2) An overall data base for children's media would provide much of the basic capability for such production.

3) Analytical indexes should be selection aids for available items as well as indexes for each current edition.

4) Production of such indexes would also permit cumulative retrospective tools to be maintained, meeting the retrospective need now met by existing tools - tools which are not well-suited for direct use with working collections.

5) There is a real need for improvement of access to materials for curricular and individualized uses not met by current cataloging and indexing procedures.

COMPUTER SEARCHING OF MATERIALS FOR CHILDREN

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Computer Searching of Materials for Children

by

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For the past few months, we have been doing computer searching of a small (fewer than 2,000 titles) data base of information about materials published or produced for children at the early childhood level. Searches have been done for library science students in children's literature and reading guidance courses, for a group of nursery school mothers, for librarians and teachers in the field, for researchers, and, of course, for our own use in testing the system.

This experimental work came about because the Library Science/ Educational Technology Division of the School of Education of the University of North Carolina at Greensboro has a Library Research and Development grant to explore applications of information science techniques to school media centers.

Computer searching was obviously one of the important areas to study. Early childhood materials were chosen as the initial test universe for a number of reasons. There is a tradition of interest in this age group within the University. We were aware of types of queries about these materials which were not being met by conventional catalogs and bibliographies. And, finally, the amount of material in print was small enough for us to make our data set very nearly comprehensive of the recommended titles appearing in basic selection aids like the Elementary School Library Collection and the Children's Catalog.

All types of materials are included in the data base except 16mm film. Fairly full bibliographic and cataloging information is given. Entries also include annotations, reading and interest levels where available, price, and suggested priority of purchase for school media centers and public library children's services. We are most grateful to the Brodart Foundation for permission to use annotations from the Elementary School Library Collection, an initial and basic source.

For reasons of economy and flexibility, the input format was locally designed. The data are linked to the appropriate MARC (MAchine Readable Cataloging) records of the Library of Congress by inclusion of Library of Congress card numbers.

For much of the trial period described here, the data base included a very broad range of the easy and picture books (and similar non-print items) listed in basic selection aids, but was much weaker in inclusion of materials at the early childhood level classified as non-fiction by these tools. This caused problems for some types of searches. These items have now been added, together with non-print items for grades K-8.

We hope to be financially able to expand to include all recommended in-print titles at the elementary level, estimated at a total of fewer than 15,000 items. In addition we have acquired (and adapted our search programs to) the records for all juveniles covered by MARC, now well over 30,000 titles.

What follows is, however, a non-technical account of our experiences in doing computer searches of only the early childhood materials described above. We expect that much of what is discussed will remain true even when the large universe is searched, however, because we will usually be able to search only a segment of the total titles since most requests will be for materials suitable for a particular age or reading level.

Our search programs permit specification of the data element or elements to be searched within a record. That is, a search may be of subject headings, titles, text of annotations, authors, added entries, for example, or any combination of these. Searches may also specify such additional elements as publisher, date, format, reading or interest level, class number, and so on.

Search terms may be multi-word terms, single words, word beginnings or endings, or simply specified strings of letters or characters. Searches can be on any logical combination of terms, using 'and', 'or', and 'not'.

The small size of the data base permits economic use of serial searches without creation of structured or inverted files. Translated from the jargon, this means that the file includes only main entries with tracings, each entered only once, with no indexes;

and that the entire file is scanned each time we make a search. Searches may be made interactively from a computer terminal; entered and/or retrieved by terminal for batch processing; or simply batch processed. The latter is most often used for convenience in running group requests.

Output is in appropriate alphabetical order and bibliographic format, paged and with running heads in an 8½ by 11 inch size suitable for xerox, offset, or other reproduction.

Costs are low, varying primarily with the number of titles to be printed out, with the average cost per search running under five dollars, considerably less than the cost of having the same bibliographic information typed.

This means that even those searches which identify no titles which could not have been readily located through the normal use of a card catalog can be useful and well worth running. One search request was for ABC books. No title was located which did not have the subject heading 'ALPHABET BOOKS,' but the search did provide the requestor with a neat, portable printout listing which would have required much more time and money to type or to transcribe manually.

Other search techniques tested have consistently produced useful results not possible through the use of a standard catalog of the same materials. Such searches can be used to enhance library services to individuals and groups, to provide useful data for research, and to identify gaps in the data base or in the literature.

Some examples may be of interest. In the case of one nursery group, the mothers wanted materials useful with small children where there might be actual or potential jealousy of a brother or sister, or sibling rivalry. The term 'sibling rivalry' does not appear anywhere in the data base. A search on 'sister' or 'brother' as the beginning of a word (to allow for plurals) resulted in a print-out of 65 titles. Of these, 37 were chosen for examination as possibly useful on the basis of the annotations. After a check of the actual books and materials, 23 were finally selected for use by the group.

Twenty-three of a group of 65 titles would not seem like a very good result. However, it is important to note that a much higher percentage of false drops can be tolerated than would be true for a larger system. A 'false drop' occurs when a title meets the literal search criteria, but is not actually suitable for the user's purposes. False drops can be relatively easily eliminated because search outputs tend to be relatively small, and because each title is annotated.

Sometimes false drops may far outnumber useful titles, but the search still produces useful results. Fear of the dark is a fairly common phenomenon in children. The term itself does not appear in the data base. A search on 'bed' or 'night' or 'dark' and 'fear' in subjects, annotations, and titles produced no hits at all. Elimination of the last search term resulted in 104 hits, only three of which were directly useful, though others were of possible value. However, as in the case of the sibling rivalry search, we could think of no other way in which we could have so quickly have located those three very useful titles. The same search also suggested titles useful for other purposes, such as with a child about to spend a night at a friend's house for the first time.

A fairly high percentage of false drops is typical of most searches. Analysis of user evaluations of nineteen recent searches showed that 26% of the titles in the search printout were considered 'definitely useful.' An additional 17% were 'possibly useful,' and 44% were 'definitely not useful.' The possible usefulness of 11% of the titles could not be determined from the annotations or on the basis of the user's previous knowledge of them.

User acceptance of the search service is high, the vast majority of users considering the search results well worthwhile. Negative comments (and results) were almost entirely caused by user misunderstandings about the nature of the data base or the nature of the search process, or both.

Some quite enthusiastic users had similar misunderstandings about the system. It was not clear to them, for example, that a number of searches could not be said to have detected all of the possibly useful items because of possible inadequacies of search phrasing, the way in which subject headings were assigned, or the accident of inclusion or exclusion of particular words or terms in annotations.

Despite the fact that we have been dealing with intelligent users to whom the system has been carefully explained, we have found that they have great difficulty in expressing exactly what they want, and even more diffidulty in suggesting appropriate search patterns. Because of this, project staff have generated most of the actual search requests. We have found user interviews after the user has filled out a written search request form are usually necessary in order to provide adequate background for staff in phrasing searches.

We are also developing various aids to help in searching. A listing of the subject headings and subdivisions assigned to items in the data base, together with their frequency of use, has proved a valuable staff tool. From it, we have made a number of classed listings of headings: geographical references, ethnic or racial groups, animals, plants, and so on. These have also been quite useful. We have produced a rank/frequency list of occurrences of individual words in subject headings, and have just done this for words in titles and annotations.

The availability of such lists would be of great value in picking out all words in the data base indicative of, for example, sex, or to help meet such requests as a recent one about children experiencing various emotions. Our preliminary list of words in annotations in part of the data base has raised stimulating questions for possible research: the apparent popularity of particular names, especially forenames, is interesting, as is the fact that 'he' occurs much more often than 'she', but 'mother' more often than 'father'.

As might be expected given the nature of the materials covered, many of our requests (and many of those which produced some of the most interesting results) center around materials for specific uses rather than about topical subjects as such. What is wanted are books useful for a child who is about to begin school or go to the hospital for the first time, not school stories as such, or books about hospitals.

Requests also reflect current societal interests and concerns, with queries for materials depicting black children and families, grandparents, and parental roles, or for materials useful in values education or for special education groups. In some cases, searches have indicated gaps in the literature, or perhaps the need for editors of selection tools to cast wider nets.

The annotations we have used have been, generally speaking, very good. We do, however, have the feeling that their nature and phrasing might change somewhat in the future if those writing them knew they were to be used in computer searching and were familiar with computer search techniques.

As a result of our work, we have concluded that computer searching of such a small data base can be productive, useful, and economic. Because of the nature of the universe we are working with, we believe the data base could be easily expanded to take in all recommended, in-print titles at the elementary level without substantial increase in search costs. And, finally, we believe it is at least as important to be able to provide search services for children's materials themselves as it is to do this for research literature in, for example, science, technology, and education.

About the Authors

Dr. Theodore C. Hines is the Chairman of the Library Science/ Educational Technology Division in the School of Education at the University of North Carolina at Greensboro, Greensboro, North Carolina. Jerry Warren and Jane B. Martin are Research Associates in the development of a children's materials data base.

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A MULTI-LEVEL APPROACH TO COMPUTER-BASED CONTROL OF INDEXING VOCABULARIES

Theodore C. Hines

Edwin B. Brownrigg

A Multi-Level Approach to Computer-Based Control of Indexing Vocabularies

Abstract.- Experience with computer-based production of thesauri, heading lists, and indexes has resulted in the development of an overall system for recording and manipulating data which permits production of such tools, using the same basic input format, at multiple levels of computer programming complexity. The procedures developed are discussed in relation to:

1) Manual systems subsequently to be computerized;
2) Simple use of computer capabilities as a printer;
3) Complex thesaurus production including multiple lists, subject subdivision, and class numbers;
4) Complex development of cross-referencing by program.

The methodology is designed to be downward compatable (for systems developed for high-precision indexing) with the Z39 Standard for Thesaurus production. Numerous examples are given. The basic concept is to provide maximum flexibility in indexing vocabulary and authority list development.

Indexes to groups of materials have a tendency to grow. Initially, vocabulary control usually does not pose serious problems, particularly if index terms are specific to the indexable matter they express. Usually the indexer can refer to previous indexing to maintain consistency. Even while the index is comparatively small, however, the indexer may have trouble remembering the cross-referencing structure without some form of aid, and displays of related groupings of terms may be of value to searcher and indexer alike.

In working with a number of different indexes and thesauri over a number of years and in developing computer programs for their production, we have evolved some concepts of design which make it possible to design an indexing system, including vocabulary control, which is compatible with a broad range of production methods. This paper is a brief presentation of some of these design concepts, which may be useful to others.

It may be noted that we have pronounced opinions about certain matters related to indexing and vocabulary control, some of which are at variance with many common practices. These opinions do not, however, affect the system concepts presented, which are adaptable to almost any indexing system. Some of these opinions will be discussed here, not only because they may be usefully considered by others, but also because they illustrate the adaptability of the systems concept.

The number of basic data elements included in almost all indexes is not great. Actual entries in an index may be divided into two groups: entries containing information or showing the location of the information; and entries which refer instead to other entries: that is, in more usual terms, subject entries and cross-references. In some systems designed both for machine-search post-cordination and for producing printed indexes, cross-references may appear only in a system thesaurus and not in the printed index. We believe this to be poor systems design, but it does not affect our discussion of data elements.

The basic data elements of the first group will be discussed first. They are:

1. Subject or other primary access point, such as author or other added entries. These may be expressed, within our concept, as single words or as phrases, with or without standard punctuation, and with or without parenthetical qualifiers;

2. Subject subdivisions, modifiers, or other aids to differentiating entries for the same subject or explaining the context in which the subject is treated in the text material in question; and

3. Locators for actual information. Where locators are used, they may refer to page numbers, coding for a basic source list, or to bibliographic citations, patent numbers, etc.

More than one level of subdivisions or modifiers may occur in index entries, so that we could have:

Subject Subdivision Locator; or

Subject Subdivision 1 Subdivision 2 Locator; or even

Subject Subdivision 1 Subdivision 2 Subdivision 3 Locator

References consist of three basic parts: an access point referred from, a syndetic indicator (usually SEE or SEE ALSO) and a referenced access point. Both of the access points have the same basic structure as index entries proper, except that locators are usually omitted. They may take forms like:

Reference SEE Subject;

Subject SEE ALSO Subject;

Subject Modifier SEE ALSO Subject; or

Reference SEE Subject Modifier

For manipulative purposes, references and their modifiers are treated as if they were subjects, so we will consider them as subjects from this point on.

A thesaurus contains the data elements already mentioned as included in the index, except that locators are omitted, and classification notations may or may not be substituted for them for used subjects. There may also be additional types of syndetics (USE, USED FOR, X, XX, BT, NT, RT), and scope notes. For thesauri, we prefer SEE, USED FOR, and BT, NT, and RT as being the most logical and explicit means of expression. Using BT, NT, and RT may also save considerable space.

We have now distinguished all of the basic data elements which must be program-identifiable for quite sophisticated computer manipulation. To secure this identification, we must tag the elements.

For an upward-compatible system, we have devised tags which may appear without ambiguity or causing distraction if they are actually printed out for the index user.

1. A subject (or reference access point) is identified by the fact that it begins a new line or card.

2. A modifier may be identified by being preceded by either a space, hyphen, space or by a colon and two spaces.

3. A locator or class notation is preceded by three spaces.

4. A syndetic or scope note is preceded by four spaces. The syndetic is distinguished from a scope note by also being preceded by the syndetic term. Syndetic terms may not be used to precede scope notes.

5. Run-over lines or cards have the first line end at the end of a word or data element, and the follower line indented one space or beginning with the tag of the data element to follow if the break was at the end of the preceding data element.

The above description is more complex than actually teaching a typist to follow the rules by providing examples.

With the addition of a few more spacing rules (space between initials, double-space before parenthetical qualifiers and subordinate parts of names of corporate bodies), the resulting input can be quite satisfactorily computer-filed in most cases by use of a brief sort-key generator module which simply sets punctuation marks equal to the nul string in the sort-key. Manual filing and eye (rather than key) verification of these entry forms are obviously quite simple.

While both indexes and thesauri may consolidate locators and class notations and eliminate repetitions of subjects or subjects and modifiers for clarity and to save space, entries intended for manipulation must include all of the data elements with each separate entry.

We believe that this analysis of data elements applies to almost all indexing, thesaurus, and subject heading lists in common use. It makes provision as well for some quite sophisticated additions to thesauri, which will be discussed below.

It will be noticed that the basic data design is not only suitable for recording index - and thesaurus - entries for a completely manual system, but provides for initial computer use in the crudest and most obvious way, that of using the computer simply as a printing device which reads a line and prints that line. The data file for this could be manually arranged. The resulting index would not suppress repetition of data elements in successive entries, of course, nor would it be paged. However, it would be quite satisfactory for internal use or, after editing for style, as a manuscript for a conventional printer. Examples of each subject and cross-reference could be copied for the thesaurus, with entries for scope notes, subdivisions, class notations, and reverse cross-references then manually created and filed. This would permit a working basic thesaurus to be produced, like the index, by using the computer as a line-for-line printing device.

Such a simple set of procedures as those described above is not to be despised. It achieves considerable savings over a purely manual system if the index entries are cumulated at all or if it is desired to update the thesaurus at intervals. The savings are achieved, of course, by the fact that editing is relatively easy and rekeying of index of thesaurus entries is reduced to a minimum.

Use of this data analysis and recording pattern, because of the ability to identify all significant data elements by program, provides a fail-safe method of developing computer-based tools, since it will always be possible to produce a viable index regardless of the state of development of the computer programming effort.

It also makes possible the successive development of computer programs in a staged fashion and in a number of interesting ways. The most obvious initial steps would be to page index or thesaurus output and to provide paging and running heads; then to have a program step to consolidate the different locators or class notations of otherwise identical entries; and then to eliminate repetition of subjects and subdivisions in successive entries.

In our own programming, we have introduced a broad range of additional features at various times and for various purposes. Some of these produce quite conventional types of outputs, others produce types of thesaurus entries which are novel to our systems or represent novel adaptations of subject heading practice. Some discussion of examples of each follow.

Basic entries for the thesaurus may be generated automatically by a program element which eliminates locators, suppresses repetition of entries which otherwise duplicate one another, and passes the results as thesaurus entries for consideration. If a routine is incorporated into the index program to suppress tags other than those given above, new entries can be tagged for passing to the thesaurus data base in a continuing index, and entries not wanted in the thesaurus (personal names, for instance) may be tagged either for complete exclusion or for entry in a separate name authority file.

If, in index input, NT and RT are used instead of SEE ALSO, appropriate program elements can generate SEE ALSOs for the index proper and then automatically produce both the NT and RT entries plus the reciprocal BT and RT entries for the thesaurus.

In our thesaurus programs, we have made provision for automatic production of separate alphabetical entries for subdivisions generally like those in subject headings lists but different in that the thesaurus will show what specific subjects have had a specific subdivision applied to them. Another novel feature is that of providing, rather than a KWIC listing of used headings only, references from the inverted forms (or, to coin a term, reverted form of inverted entries) of all conventional access points to appropriate original entries.

We have mentioned above the production of authority lists and that some thesauri include a KWIC index of used subjects. The input and data element identification systems described above permit the production of many other special lists as parts of a thesaurus. The basic list can be used to generate a used term listing, a KWIC index of used terms, a subdivision listing, a listing by class notation, and a listing of the hierarchies of used terms implied by the syndetic structure. The hierarchies program section may even permit (as does ours, which was written by Dr. Keith C. Wright) a term to appear in different hierarchies at different levels simultaneously - CATS, for example, may be both rodent control devices and pets.

Of course, for any given indexing and thesaurus system, some of these entry forms or lists may be quite unnecessary: for some indexing systems, the index itself may be an adequate vocabulary control device without any need for a separate thesaurus. What is useful about our approach is that it may be tailored to needs, and revised to provide for more complexity either as programming time permits or as the need for particular features become apparent or are made necessary by the growth of the indexed universe. Obviously, it also may permit selectivity in inclusion of thesaurus items, by dropping older headings, for instance, or including headings on the basis of frequency counts.

The above brings to mind the fact that it should be noted that the basic idea of the tagging system is flexible enough to accomodate not only additional tags but also additional data elements, such as the date of first or most recent use of a heading for example.

Whenever a given feature of the system is desirable but the necessary program element has not yet been written, entries for it can always be manually produced in the knowledge that they will continue to be compatible in the future and also that they can be handled by all of the program segments already produced.

Various elements of the system described above have been used in the production of a number of published and in-house thesauri and indexes, including the thesaurus of the Columbia University International Institute for the Study of Human Reproduction,[1] Dr. Hilda Feinberg's Cosmetics and Perfumery Thesaurus,[2] Dr. Barbara Preschel's index to the Columbia Journalism Review,[3] Dr. Keith Wright's Urban Affairs Thesaurus,[4] the Guide to Indexed Periodicals in Religion by John Regazzi,[5] and others. Specialized use of the concepts for unusual handling of subject headings has recently been made by Jerry Warren.[6] A special related development not described here should be noted: Dr. Feinberg's concept of standardized modifier phrases permits the use of such modifiers in a printed index while providing for automatic inclusion of terms used within modifiers in a coordinate index for computer search. These standardized modifiers are discussed in the preface to her thesaurus.[7]

We believe the concepts described here to be basically simple and of wide and flexible applicability, and would be grateful to receive correspondence and comment.

Notes

[1] Samuel Wishik and Kathryn Speert, The Deval Thesaurus (Columbia University: Institute for the Study of Human Reproduction, 1971).

[2] Hilda Feinberg, Cosmetics and Perfumery Thesaurus (Macmillan, 1972).

[3] Barbara Preschel, Columbia Journalism Review Cumulative Index, Vols. I-IX, Fall 1961-Winter 1970-71 (Columbia University, School of Journalism, 1971).

[4] Keith C. Wright, Urban Affairs Thesaurus (1970), unpublished.

[5] John Regazzi and Theodore C. Hines, Guide to Indexed Periodicals in Religion (Scarecrow Press, 1975).

[6] Jerry Warren, Series of specialized lists of subject headings for school library use. Library Science/Educational Technology Division, School of Education. University of North Carolina at Greensboro, 1976-77. (Mimeographed.)

[7] Op. Cit. pp. 103-6.

CHILDREN'S MEDIA DATA BANK AND INFORMATION CENTER: A LIBRARY RESEARCH AND DEMONSTRATION PROJECT

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CHILDREN'S MEDIA DATA BANK AND INFORMATION CENTER: A LIBRARY RESEARCH AND DEMONSTRATION PROJECT

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A project proposal application under the Higher Education
Act, Title II-B, Library Research and Demonstration
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Greensboro, North Carolina
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TITLE OF PROJECT: CHILDREN'S MEDIA DATA BANK AND INFORMATION CENTER: A LIBRARY RESEARCH AND DEMONSTRATION PROJECT

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AMOUNT OF FEDERAL FUNDS REQUESTED: $ 69,119.70

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Abstract.--Building on substantial preliminary work, this proposal requests funding to build the data base and fundamental service capability for a prototype Children's Media Data Bank and Information Center. Initially limited to materials in all media at the pre-school and elementary school level currently recommended by basic general selection tools in the field, the data base would be designed for expansion. Search and other service capabilities would be provided for information on these materials (12,000 to 14,000 titles) and also for the estimated 37,000 juvenile titles in the MARC records of the Library of Congress. A scaled approach is proposed for substantial augmentation of access to materials listed in the data base. The materials to be covered have an exceptionally side potential audience of children and parents served through as many as 50,000 school media center and public library service points in the United States. The proposal concept has been endorsed by a number of authorities in the field. The combination of physical resources, skills, and capabilities represented by the Library Science/Educational Technology Division, its Center for Instructional Media, the School of Education, and the University are unusual if not unique. The amount of funding requested is low in comparison with potential returns. Continuation of funding will be sought, but is not requisite for achievement of substantial results. Provision is made for adequate project evaluation and dissemination of results.

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I. The Problem; Needs Assessment; Significance, Impact, and Relevance

Under the Library Research and Demonstration section 223 of the Higher Education Act, Title II-B, grants may be made

> . . . for research and demonstration projects relating to the improvement of libraries or the improvement of training in librarianship, including the development of new techniques for processing, storing, and distributing information, and for the dissemination of information derived from such research and demonstrations . . .

This project proposes research and demonstration in the application of information science and technology to increasing information access to children's media center materials through the establishment of a prototype Children's Media Data Bank and Information Center.

The project is also designed to provide intensive training to a small nucleus of children's librarians or school media coordinators with leadership potential, and to provide practical assistance and information to a much larger group. It is so planned as to provide for continuance beyond the grant period, and to provide for appropriate dissemination of products, results, and information.

A. School and Public Library Media Centers for Children and Their Information Needs

School media centers make up the majority of all libraries in the United States. There are more than 35,000 of them, far more than any other single type of library installation. In addition, more than 9,000 public libraries or library systems, many with multiple branches, maintain services and collections especially for children. The actual and potential clienteles to be served consist of more than 50,000,000 persons under fourteen years of age, their parents, their teachers, and others who work with children.

The libraries serving these clienteles are important indeed, as they constitute the major national resource for instructional and informational materials for children. Despite restricted budgets, they purchase the vast majority of all educational materials published or produced for children. They account for over 90% of the sales of all quality juvenile trade books published.

The growth in number and size of school media centers in particular in the United States since the late 1950's has been phenomenal, particularly during the period of heavy Federal encouragement under Title II of the Elementary and Secondary Education Act and the National Defense Education Act. Despite the decline in the elementary school age population, the number of such centers is still growing and this growth may be anticipated to continue as efforts are made to reach the goal of a professionally serviced media center in every elementary school, and with increases in mediated and individualized instruction.

School media centers - or at least the best of them - are leaders, pace-setters, and trend-makers in several important aspects of librarianship. They are characterized by the fact that they collect and service all types of media to a degree not found in most libraries. They, together with community college libraries, are more likely than other types of libraries to be moving toward the concept of the library as a true learning resource center, heavily involved in educational technology, media production as well as media servicing, mediated and individualized instruction, and instructional packages.

It may be anticipated that public library children's services will have to move in these directions as well. The importance of varied and diversified stimuli and contact with appropriate media at an early age, particularly for children from disadvantaged families, is well established. Public library children's services, especially in impacted urban areas, represent the basic resource, still to be fully exploited.

Children's media centers in schools and public libraries alike have a definite and growing need for information access not now provided by conventional bibliographies, indexes, and catalogs. Non-print media are still not adequately covered by published listings and catalogs, by Cataloging-in-Publication, or by Library of Congress printed cards and other sources of cataloging information.

This problem might well be met through increased coverage by existing services. In other instances, however, what is required is different and more extensive types of access to the materials.

With notable exceptions, conventional cataloging and most other reference sources cover conventional bibliographic access points and provide topical subject access to works considered as a whole. Library cataloging is usually quite limited even in the topical subject access provided, averaging far fewer than three headings per item.

In general, access to materials by types or genres, by reading levels, and, especially, by types of uses, is still quite limited. There is a real need for better access through active and selective dissemination of information; provision of information about items useful in a particular curricular or instructional context where this is not brought out by conventional subject heading practice; provision of access to types of material of value in working with such groups of children as the handicapped and others requiring special education and the disadvantaged; provision of access to materials useful in such areas of current concern as values education and ethnic awareness; and provision for post-coordinate searching.

Since school media coordinators and children's librarians are not often specialists in information science or library technical services, these needs are not often articulated in the literature in this way, but we have verified our own observations and comments from the field in this area by correspondence and/or discussions with such professional colleagues and authorities as Mary V. Gaver, Professor Emeritus of Library Service at Rutgers University and founder of *The Elementary School Library Collection*; Dr. Frances Henne, formerly school library specialist at Columbia University who dealt with this question in her Bowker Memorial Lecture last year; Winifred Duncan, Priscilla Moulton, and Anne Markey, who chair or have chaired the Children's Cataloging Committee of the American Library Association; Dr. James Frazer, editor of *Phaedrus* and a noted authority on children's materials; Lillian Gerhardt, editor of *School Library Journal*; and Edward J. Blume, David Remington, and Lois Rose of the Library of Congress. Letters endorsing the concept of this proposal from some of the above are attached, and Dr. Henne has endorsed the project concept in a recent telephone conversation.

B. Children's Media Data Bank and Information Center

The value of the data bank and information center concept in education is amply demonstrated by the ERIC (Educational Resources Information Center) system, which now provides up to 20 or 30 access points per item in a machine-readable data base totaling hundreds of thousands if items and supports a number of ERIC Centers.

ERIC is so valuable and so important to educational research and to the application of results of research that it seems strange that the concept has not been extended to provide such a data bank and information center for the actual materials used with and by children as a basic part of the educational process.'

This is the more surprising if we consider that the size of the universe to be covered to provide an initial viable and useful data base for materials at the pre-school through elementary school levels is quite small by data bank standards, almost certainly totaling fewer than 15,000 items.

This figure is, of course, a rough estimate. Of the basic comprehensive selection aids for children's media, the current edition of the Wilson Company's Children's Catalog lists fewer than 5,500 books. The Elementary School Library Collection, published by the Brodart Foundation, includes all media except 16 mm films and lists fewer than 10,000 items. Since Annotated Card (juvenile) cataloging has been included in MaRC (MAchine-Readable Cataloging) at the Library of Congress, some 37,000 titles have been listed. Many of these are, of course, either out-of-print, above the elementary school level, or, for one reason or another, not included or reviewed in the basic selective and evaluative reviewing and listing tools and services.

It should be noted, of course, that such selection aids as the Children's Catalog and The Elementary School Library Collection are retrospective tools, and include many titles not covered in MaRC because they were published previous to the beginning of the MaRC service. It is of interest and relevance to note that good juvenile titles are exceptionally long-lived and tend to remain in-print and used.

C. Significance, Impact, and Relevance of a Children's Media Data Bank

The significance, impact, and relevance of a Children's Media Data Bank could be profound. The ability to provide increased access tailored to uses of materials and the ability to make demand searches on the ERIC model alone would provide a substantial stimulus to appropriate use of media to meet particular needs. Such a data base could serve to indicate gaps in the coverage of topics or areas in children's media, and thus encourage production of needed materials. It could stimulate research and interest in children's media, thus raising standards of quality and increasing our insights as to the nature of these media and their treatment of such topics as racial and sexual discrimination, sex roles, values education, ethnic groups, and other societal concerns. Finally, of course, it could serve as a basic resource for the development of all types of bibliographic, indexing, reference, and educational tools for children's media.

II. Objectives, Activities, and Scheduling

Basically, the proposal requests funding for the research and development work required for the establishment of a prototype Children's Media Data Bank and Information Center, initially strong enough to provide real and needed services, and capable of expansion to more comprehensive and intensive coverage and services.

A. Specific Objectives

1. To provide a machine-readable data base comprehensive of, or nearly comprehensive of, those children's media for preschool children through the elementary grades listed in basic selection and evaluation tools for such media, including as much information about each title as can readily be derived from existing sources.
2. To provide a demand computer search service for this universe of materials for teacher education faculty, teachers, librarians, parents, and children on an experimental basis with provision for evaluation.
3. To continue and expand existing research and development work at this facility on procedures and computer programs for increasing information access by computer manipulation of existing subject access terminology, by human augmentation or classification of existing subject access terminology, by development of new types of access in relation to uses of materials, and by further development of analytical indexing

of groups of materials.

4. To apply the techniques mentioned above on a pilot or experimental basis to selected segments of the data base, with provision for testing and evaluation.

5. To continue and expand existing work at this facility on the application of information science techniques to juvenile materials, and to disseminate information on such applications.

6. To provide an evaluative final report on which a decision in regard to continuation of project support under the Library Research and Development Act could be made.

7. To prepare for publication papers or reports on particular aspects of the project.

8. To so design the project as to provide for its continuation on a significant, if reduced, basis without outside financial support.

B. Activities

Basic activities are listed below in a rough priority order, chosen to provide effective results for the project as quickly as possible. These are:

1. To establish a basic data base by expanding the number of existing machine-readable records (see Resources below) to include as many currently useful titles as possible from early childhood through the elementary school levels, estimated as 14,000 or fewer items. Since a quite significant, though unknown, proportion of these titles are not covered

by MaRC, and since a requirement of the project is to be able to add information and access not readily accomodated in MaRC format, the local input format will be used. Wherever possible, this will be linked to the MaRC records by use of LC card numbers, ISBN (International Standard Book Numbers), or both.

2. To acquire the total MaRC records to date for Annotated Card (juvenile) items, estimated at about 40,000 titles by next year. The MaRC records are already on order for the Division. However, at some point during the year the Library of Congress plans retrospectively to revise some of the subject headings assigned to these materials to bring them into line with current practice.

3. To expand and improve computer search programs for local input format records. The existing programs are for serial search only. It may be necessary to produce inverted files and/or a different search program.

4. To provide a basic search program for the MaRC data, assuming that this has not been done by the beginning of the project as part of currently ongoing work. Serial search only is assumed, but should be so designed as to search any or all MaRC data elements for strings, words, terms, or roots in a Boolean logical combination. This is true of the existing program for searching the local record format.

5. To produce a rank/frequency listing of subject headings and subdivisions assigned items in the basic data bank for use

as an aid in searching and as a research tool.

6. To produce a rank/frequency listing of words used in annotations for items in the basic data bank for use as an aid in searching and as a research tool.

7. To make available a demand search service for teacher education faculty, library science and media students, teachers, parents, and (if possible) children, with provision for evaluation.

8. To do staged augmentation of information access for all or part of the data base, as seems feasible, beginning with operations which can be carried out purely by rule (computer program), and continuing with those which can be computer-assisted (classification of headings into useful groups, for example), and then moving to augmentation requiring human judgement and assignment of terms based on previous knowledge of the materials or on information provided by annotations. Last priority, for which, however, prototype studies at least will be made, will be augmentation requiring human analysis with the work in hand.

9. To produce samples of reference or bibliographic aids, and indexes, or listings which might usefully be derived from a Children's Media Data Bank.

10. To report the project appropriately, through articles, technical notes, and summaries.

C. Scheduling

Careful scheduling will be required in order to achieve significant results during the initial year of this project.

1. Truly useful testing of the concept of a Children's Media Data Base requires the completion of machine-readable input for the basic 14,000 or so titles as quickly as possible, and certainly during the first six month period.
2. Required search program improvement and debugging will begin at the onset of the project, with target date for completion as soon as possible - preferably within three months.
3. Reorganization and debugging of programs for subject heading listings, analysis, and computer augmentation of headings will be carried out during the first three month period.
4. Human classification and augmentation of subject headings will be continued from its existing status at the beginning of the project, and should be substantially completed (additional groupings will always be possible) by the end of the first six month period.
5. Augmentation of access by an indexer will be carried out for especially suitable sections of the data base throughout the project, but primarily during the last six months.
6. Experimentation with analytical indexing will be limited to the final six months of the project, and done as time permits.
7. Adaptation, debugging, and documentation of other computer programs will be carried out over the entire project period.
8. Work on the MaRC search program is already under way. If not completed before the project begins, it will be completed

during the first quarter.

9. Appropriate explanatory material, search request forms, and search evaluation forms will be completed in time to be distributed as soon as the basic data base is ready; i.e., at least by the end of the second quarter. Demand searching will be solicited, carried out, and evaluated during the rest of the project.

10. Work on reports, articles, technical notes, and summaries will proceed throughout the life of the project, but primarily during the last two quarters.

11. It is anticipated that a significant amount of material for publication will be prepared after the end of the project year, in order to report on as long an experimental use period as possible.

III. Resources

The nature and situation of the Library Science/Educational Technology Division of the School of Education of the University of North Carolina at Greensboro are such as to provide a quite exceptional combination of assets for carrying out this proposal.

These include:

. . . an ongoing project on the use of computer based systems for increasing information access to school media center materials, for which more than 3,000 titles, primarily at the early childhood level, are already in the machine-readable form proposed for this project. Most of the basic adaptation of earlier programming for this current project has direct applicability to the work outlined in the proposal.

. . . project directors with unusual and innovative experience, knowledge, and skills in school media center organization and materials, computer programming, and design and production of computer based information tools and services.

. . . an exemplary collection of all types of school media center materials readily available in the Center for Instructional Media. The Center is run by the Library Science/Educational Technology Division, serving the Division and teacher education programs within the University. It also functions officially as the media examination center for the Greensboro city public school system.

. . . direct and easy access to both large-scale and minicomputer services, with both batch and interactive terminal processing readily available.

. . . laboratory facilities within the Center for Instructional Media both for teaching the use of instructional equipment and for media production.

. . . a graduate level student body and an active and cooperative alumni group, many of whom are currently working in school media centers or public library children's departments and have some background in instructional design, curriculum development, and the use and production of instructional materials.

. . . a very close relationship with the School of Education, permitting easy access to expert advice and assistance in such areas of specialization as administration, curriculum, counseling, and special education.

. . . exceptionally close relations with the Greensboro city schools and other surrounding school systems.

. . . excellent relations with the triad area public libraries. For example, the Director of the Greensboro Public Library serves as adjunct teaching faculty.

. . . University library facilities with excellent general collections and special strengths in education and school librarianship.

Some particular assets for carrying out a project of the type proposed are discussed in more detail below.

A. Project Directors

Brief conventional vitae are attached, but it would seem useful to bring out some salient and particularly relevant background here.

Professor Mary Frances Kennon Johnson is a well-known authority in school media centers, library education, and informational and educational materials for children. Her experience in this area includes work in both rural and central city (Baltimore) school media centers and libraries, work at the state level for the North Carolina State Department of Public Instruction, and work at the national level with the American Library Association in Chicago. She was, along with William Hug, co-editor of the current standards for school media centers.

Her expertise in children's literature and materials is well established. She served this year, for example, as a member of the Newbery-Caldecott Committee of the American Library Association, which selects the best illustrated children's book and the best children's book of the year for appropriate recognition.

She has published widely in the professional literature, and frequently serves in consulting or committee positions for children's media, school media center operations and standards, and library education and accreditation.

As founder and former Chairman of the Library Science/ Educational Technology Division, which she developed from a single undergraduate course into an all graduate program awarding the Master of Library Science degree and authorized to plan for a Master of Educational Technology degree, she has shown strong administrative ability in developing a program that is highly respected at the state level and beyond.

Dr. Theodore C. Hines is a former public library children's librarian and was in charge of school library services in Washington, D.C. He holds the M.L.S. and Ph.D. (Information Science) from Rutgers University. He did systems design and production for what is believed to be the first computer-produced school library book catalog (Farmingdale, Long Island, 1968). He has served as consultant on technical services and library automation to school systems as widely scattered as Calgary (Alberta) and Montgomery County (Maryland). He recently completed an experiment in producing a computer-based union list with inexperienced personnel conducted in cooperation with the Scarsdale (New York) public school system.

His direct experience in computer programming and systems design dates from 1958; and he has worked with the IBM 1620, and 1400 series, and the 7090, 360/75-91, and 370/165 systems as well as with the Hewlett-Packard 2000F. He has worked in or experimented with FORTRAN, COBOL, PL/I, LISP 1.5, COMIT, SNOBOL/ SPITBOL, and BASIC.

An expert in indexing and information access, he served on the original ERIC Panel on Education Terminology and on the board of the Social Science Citation Index. He is now on the American Library Association's Children's Cataloging Committee and its Committee on Educational Terminology. He has done systems design programming, and production on a very wide variety of information tools and services, including concordances, thesauri, a newspaper morgue system, periodical indexes, bibliographies and catalogs, and indexes to reference tools. He has served as consultant or designer on information tools and systems for such diverse organizations as the American Chemical Society, Engineering Index, Grolier, Macmillan, the Smithsonian Institution, International Pipe and Ceramic, the Phelps-Stokes Fund, and the American Banking Association.

Lois Winkel (Mrs. Theodore C. Hines) is a former elementary school teacher and school media specialist with experience at P.S. 144 in Harlem and in the Darien (Connecticut) public schools. She holds the M.L.S. from Pratt Institute, and is eligible for the Advanced (6th year) Certificate in Librarianship at Columbia University, where she is currently completing a doctoral dissertation standards for school media centers. She has taught courses in children's media or school librarianship at Rutgers, the University of North Carolina at Greensboro, and at Columbia, where she introduced the field experience program in school librarianship.

She has considerable computing experience and is familiar with programming, choosing a programming language as one of the qualifications for her doctorate and having done bibliographies and book indexing by computer.

She was the editor and compiler of Issues in Children's Book Selection (R. R. Bowker, 1973), and is recognized as an authority in this area of the field.

Consulting assignments particularly relevant to this proposal include a study of children's media evaluation centers undertaken under the joint sponsorship of the State of Florida, Leon County, and the University of Florida at Tallahassee.

She is at present, part-time, Associate Editor of The Elementary School Library Collection published by the Brodart Foundation. Now in its tenth edition, it may be said to be, with the H. W. Wilson Company's Children's Catalog, one of the two basic retrospective selection aids for children's materials.

B. Center for Instructional Media

The Center for Instructional Media could be described as the media teaching and evaluation facility of the Library Science/Educational Technology Division. It serves also as the official media evaluation center for the Greensboro city schools and unofficially for other area school systems as well.

The Center proper has a floor area of 8,627 square feet, with thirty-five wet and dry carrels with provision for using all types of media, ten individual study tables, and additional seating for fifty-eight at library tables or in lounge furniture. Related adjacent areas include a library technical services laboratory and workroom (978 sq. ft.), a preview room (150 sq. ft.), a microteaching laboratory (300 sq. ft.), an audiovisual production laboratory with darkroom (829 sq. ft.), television and audio production studio (1,084 sq. ft.), and soundproofed computer terminal and programming room (296 sq. ft.). Classrooms, seminar rooms, office areas, and a small canteen adjoin the Center.

The Center has a professional staff of two; both are members of the Library Science/Educational Technology Division faculty. There are two full-time technicians and a number of graduate assistants. The Center develops and administers various self-instructional or mediated instruction units, primarily in the use of media, media equipment educational technology.

The Center seeks to avoid duplication of materials held by the University library. Emphasis is placed on materials for early childhood through secondary levels, including tradebooks, texts, and audiovisual materials. These latter include, in addition to films, filmstrips, records, and video and sound tapes, realia, games, toys, simulations, microfilm, microfiche, and kits. Some professional materials in education not collected by the University library are provided, such as curriculum guides, texts, pamphlets, and non-print materials for use in undergraduate and graduate teacher education. There are small supporting collections of bibliographic tools, indexes, reviewing journals, and equipment and publishers' and producers' catalogs. Total collections exceed 25,000 items.

The distribution of materials for children is indicative:

Early childhood	45%
Intermediate (grades 4-8)	30%
Secondary (grades 9-12)	25%

This distribution indicates especially good coverage of the elementary level, which will be of great value to the project.

Equipment holdings are of importance, too, as the project plans to develop both print and non-print teaching aids, for individualized use whenever possible. A rough list of items shows: 14 filmstrip projectors, 26 filmstrip viewers, 7 slide projectors, 21 record players, 48 tape recorders (reel-to-reel and cassette), 20 motion picture projectors, 15 overhead projectors, 2 opaque projectors, 6 videotape recorders, 8-12 monitors and receivers, 6 video cameras, and considerable additional equipment such as copy stands, cameras, lenses, etc.

The equipment in the Center for Instructional Media is used primarily for teaching purposes and for limited production by students as part of their educational process. For larger scale production, if any, the project will use the facilities of the University Instructional Resources Center, with its color television studio, staff of twenty, and extensive duplicating and copying facilities.

The Center for Instructional Media now has two computer terminals, one with cassette recording and editing facilities.

The Center is open 72 hours per week or more. A Center brochure showing its physical layout and some of its services is attached.

Because of its collections, its position as a teaching arm of the Library Education/Instructional Media Program, its laboratories, its close connections with the Greensboro and other area school systems, the Center is an unusual, if not unique, existing resource for the proposed project.

C. Academic Computing Facilities

The University of North Carolina at Greensboro maintains separate Academic and Administrative Computer Centers. The Academic Computer Center provides access to two computers, an IBM 370/165 and a Hewlett-Packard 2000F. Both mainframes are physically located in the Triangle Universities Computer Center (TUCC).

The 370/165 services are on a par with those of other large major university computer centers: a large program library, some hundreds of different data bases; more than ten statistical packages; an interactive terminal system;

and a wide variety of higher level languages, including PL/I and SNOBOL/SPITBOL.

The Hewlett-Packard is an interactive system, and has an extensive library of interactive programs, including games, drill programs, and CAI (Computer Assisted Instruction) in a number of areas. There is a version of Coursewriter as well as another CAI package, the Instructional Dialog Facility (IDF). User programming is in an extended BASIC, with fair string handling capability.

The Academic Computer Center provides two main campus facilities for batch processing, with associated input equipment, EAM equipment, printers, and six public terminals. The total number of terminals on campus is not known, but there are a number of remote users including, as noted, terminal facilities in the Center for Instructional Media. These facilities are available 72 hours per week.

These resources closely match project needs.

D. University Library

The University Library holdings now exceed three-quarters of a million volumes. Since more than 50% of the graduates of the University become certified as teachers, holdings are especially strong in education, including librarianship. This collection contains more than 50,000 monographs, perhaps 90 percent of the titles listed in the basic indexes of these fields, and extensive microform holdings, including the ERIC microfile which alone now approaches 100,000 titles. Computer searching of most of the major data bases is available through the libraries.

No difficulty is anticipated in meeting project needs for library services.

E. Library Science/Educational Technology Division

Some aspects of the Library Science/Educational Technology Division should be mentioned to indicate that the program proper provides exceptional resources for the project.

It has been mentioned that the Division program is at the graduate level and offers the Master of Library Science degree with the Master of Educational Technology pending. Most courses for the latter degree are already given. Sixth year programs are in the planning stage, but through cooperative arrangements with other parts of the School of Education, mainly in curriculum, there are already a number of post-master's students whose programs have a significant emphasis in educational technology and school media centers.

The University was formerly the North Carolina College for Women, and current enrollment in the University and the Program reflect this--more than 90 percent of the students in the Division are female. Since the Division developed within the School of Education and for a considerable period prepared only school librarians, most students are still certified as school media coordinators, although growing numbers assume positions in public libraries, community colleges, technical institutes and special libraries.

The curriculum reflects this with its unusual strengths in children's and young people's materials, reference and selection for this group, instructional design, and educational technology. Instruction in computer programming and coursework in library automation and information science use many examples from, and take unusual, if not unique, cognizance of school media center materials and problems.

Additional faculty, other than project staff, include four experts in children's and young people's materials and two specialists in non-print media and educational technology. This group is available for consultation. Professor Cora Paul Bomar's assistance will be particularly valuable because of her special background in media evaluation centers, for which she is nationally known.

As noted earlier, the student group includes a majority of students with previous or concurrent experience in school media centers and direct library work with children. Field experience is part of their program. These students, who in addition to being exceptionally hard working, dedicated, and service oriented, offer an exceptional pool from which to draw graduate assistants for the project. The very close continuing relationship of the Alumni group to the Program, the fact that many return to it for continuing education, and the fact that most are in positions of some responsibility in school media centers makes this group unusually valuable to the proposed project as consultants, as professionals who can provide for field tests and feedback, and as a pool of possible graduate assistants.

Thus, the Division provides well for aid to the project, education of professionals in this area, and for field testing and dissemination of project results.

F. Consulting Assistance

Previous sections of this application make it evident that we may expect unusual consulting and other assistance from the field in this area. There is assurance of cooperation from the State Department of Public Instruction and the State Library. There is also assurance of informal consulting assistance from Mary V. Gaver, internationally known expert in school media center materials and Professor Emeritus of Library Science at Rutgers University.

For computer systems and large-scale computing problems, arrangements have been made to secure, at very low cost because of his interest in the project, the services of Edwin B. Brownrigg for two brief periods. Mr. Brownrigg, who is completing his doctorate at New York University, holds the M.L.S.

degree from and has advanced study at Columbia University Library School. He is library automation officer at New York University, has done systems consulting for such groups as Levitt Brothers and the Chicago Sun-Times, and has taught library automation and information science at St. John's University. Formerly owner of his own electronics business, he is an expert in terminal systems.

G. Existing Work on Related Projects

Two of the three project directors are at present engaged in work on two related projects, of which the present proposal may be regarded as a logical continuation.

One of these is a small project, funded by a private foundation grant to Dr. Hines, and is concerned with computer manipulation of subject headings. As part of this work, 12,000 subject headings and cross-references assigned to materials in all media at the elementary school level have been put in machine-readable form and subjected to intensive analysis (see attached copy of working paper presented to the Children's Cataloging Committee at the American Library Association mid-winter meeting in 1976). Further reports on this work are forthcoming.

The second project, funded by the Office of Education, is also very closely related to this proposal. Under this grant, we have already done most of the data design work and much of the computer program adaptation required for this Children's Media Data Bank proposal (see attached second quarterly report). Because of this previous work, the Data Bank will begin with about 15-30% of the 14,000 estimated citations already in machine-readable form, with considerable augmentation of access plus programs for searching and analysis.

H. Summary Statement

These resources probably form a unique combination of expertise in computing, information science, children's materials, and school media center operations. They are combined with a strong collection of materials, excellent field opportunities for testing and consultation, computer facilities nearly ideal for the purpose, good library support, and the ability to draw on experts within and outside the University in appropriate fields.

IV. Budget Statement

This section of the proposal provides amplification of and explanation of the budget items presented as part of the covering material.

A. University Contribution to the Project

The request for federal funds does not, obviously, reflect the contribution to the project which the University is prepared to make. It is not readily possible to give a dollar figures for this, but the following may be indicative.

Dr. Hines, one of the project directors, will devote approximately 20 percent of his time to direct work on the project. Approximately one third to one half of the time of Miss Winkel and 15 percent of the time of Professor Johnson, the co-directors, will be so allocated. Considerable consulting assistance is expected from Professor Bomar, others of the Division faculty, and the School of Education faculty.

Obviously, the combined value of computing assistance and equipment, Center for Instructional Materials facilities and staff time, library contribution, and other informal and formal assistance will well exceed the indirect costs requested in the budget.

This statement is included only to indicate that the University and the Library Science/Educational Technology Division have a strong interest in and commitment to carrying out this proposal.

B. Personnel

1. Graduate Assistants

For educational and dissemination purposes, it seems important to staff as much of the project as possible with student (graduate assistant) help. These are not regular salaried employees and do not receive fringe benefits. Graduate assistants work twenty hours per week, so the budget is for the equivalent of less than one full-time assistant for twelve months. The amount of stipend is that usual for the University for teaching assistants.

2. Salaried Positions

Salaried positions include one-third to one-half of the time of Miss Winkel as co-director. She at present serves as Division adjunct faculty and will probably not teach if this proposal is funded.

The two full-time, twelve-month positions are for a technical laboratory research associate and for an administrative research associate. The technical laboratory research associate will be physically located in the outer office of the terminal room, just off the Center for Instructional Media. Duties will include instruction in keypunch and terminal use, minor programming and debugging, indexing, and technical writing. Qualifications include a master's degree in librarianship or educational technology, and experience in either computing or in instructional media.

An administrative research associate for the project is a necessity if the directors are to be able to devote the time indicated or more to direct project work. Duties include setting up and maintaining files and records, minor editing, some instruction and assistance in report preparation, and supervision of reproduction of materials.

Salaries and fringe benefits are those usual for university employees at these levels.

C. Travel

Travel money is requested to permit the directors to spend up to $350 each on travel to conventions or meetings which the University would not normally pay for. The purpose of this latter travel is the gathering of information useful to the project and/or the presentation of papers or other means of disseminating information about the project. No foreign travel is involved. Consultants' expenses on site will be absorbed.

D. Equipment

No equipment purchases are contemplated.

E. Supplies

Amount is minimal, and includes paper, cassettes, stationary and similar items.

F. Contractural

Again, minimal. Includes rental of extra input equipment and $4,000 for additional computer programs.

G. Other

Included here are charges for computer time ($7,000), and outside services at $2,000.

H. Indirect Charges

These are calculated on the University basis of 37.6 percent of salaries and wages.

Calculations are on the following basis: Indirect costs are 37.6 percent of salaries and wages, exclusive of fringe benefits. Fringe benefits are social security (5.85 percent of salary up to $16,500), retirement (9.12 percent of total salary of full-time employees), and medical insurance ($22.20 per month per employee) and $3.00 per person per month for wage insurance. These costs are not applicable to graduate assistants.

I. Summary Statement

The budget is realistic but, if anything, somewhat low. No equipment will be purchased. No funding is requested for books or printing, except as a very few computer manuals, bibliographic tools, or similar items may be required.

Budget Summary

a. Personnel			
1/3 time of co-director of project		$ 7,000.00	
1 project laboratory research associate, 12 month		10,000.00	
1 administrative research associate, 12 month		8,000.00	
Subtotal	25,000.00		
2 graduate assistants, 12 month @ 4,000		8,000.00	
Subtotal	8,000.00		
Total			$ 33,000.00
b. Fringe Benefits			4,649.70
c. Travel			1,050.00
d. Equipment			--
e. Supplies			2,000.00
f. Contractural			
Input terminal or keypunch @ 85.00/month			1,020.00
g. Other			18,000.00
Computer costs	7,000.00		
Computer programs	4,000.00		
Outside contractural services	2,000.00		
LC/AC MaRC tapes	5,000.00		
Note: This figure will vary from 1,200 to 5,000 for purchase of MaRc tapes according to whether we pay search costs or copy costs			
h. Total direct charges			$ 59,719.70
i. Indirect charges			9,400.00
Total			$ 69,119.70

V. Evaluation

Some of the evaluative activities have been mentioned above. While more evaluative activity than covered below is anticipated, it is felt that the project can be judged successful and the expenditure of the funding requested fully justified, if the majority of the following are accomplished:

1. Entry into the data bank of a total of 10,000 to 14,000 titles at the elementary school level in all media.
2. Maintenance of demand searching for faculty, students, school media center and public library children's department staff, children, and others for a period of at least six months, with analysis of search requests and follow-up of evaluation forms.
3. Production of a substantial number of listings resulting from searches for topic areas known to be in demand but not met by conventional subject cataloging, and written evaluation of the usefulness of these listings by a selected group of practioners.
4. Production of useful papers (at least three) describing aspects of the project, and their acceptance by major professional journals.

One method by which the project can be pragmatically evaluated will be the extent of possible continuing support it may be able to secure from such agencies as the State Department of Public Instruction and the Greensboro Public Schools (both of which have already expressed willingness to cooperate) in the form of input keyboarding, abstracting, and possibly financial support. Another important pragmatic evaluation would be a test of the willingness of public libraries, school systems, faculty, students and others to pay for searches after the experimental period on a basis similar to that locally charged for DIALOG and other searches, as well as the extent of use during the test period.

Basically, the co-directors believe that the value of the concept has already been indicated by comments from the field the development patterns of such data banks as ERIC, and the recent call for a non-print media data bank. The materials proposed to be covered here have the largest potential audience of any materials proposed for inclusion in such systems.

VI. Dissemination

Means for dissemination of information from the data bank, and for disseminating information about specific aspects of the project have already been mentioned in the body of this narrative. They may be summarized and expanded as follows:

1. Direct demonstration to groups in the field of demand searches.
2. Production and limited distribution plus availability at selected locations of listing from the data base on topics not fully locatable from normal bibliographies and catalogs.
3. Production of articles (at least three) for publication in important journals in the fields of librarianship and/or education.
4. News releases to appropriate journals and news media on various aspects of the project.
5. Production of quarterly reports and of a major final report through ERIC.
6. Production of a manual or manuals on use of the Children's Media Data Bank.
7. Presentation of a paper or papers at appropriate professional meetings.
8. Possible development of professionally or commercially publishable materials from the data bank.

VII. Continuity and Replication of Project

It is to be hoped that this project will be successful enough to attract a continuation of the basic establishment grant from the U.S. Office of Education or some other agency. There would also seem at this point to be some real possibility of continuing support in the form of funding and/or substantial cooperation from the North Carolina Department of Public Instruction or other agencies.

This proposal was so designed, however, as to take into account the contingency that no further outside assistance might be forthcoming, as well as the fact that the University can make no commitment to provide any new funding for the maintenance of the data base.

Even should this be the case, the investment in the prototype would be justified. It would still be possible to

1. Provide copies of the data base (except for any proprietary material such as annotations belonging to some source other than the project) on a cost basis to anyone requesting this.
2. Continue searching services on a cost basis, charging sufficient fees to provide limited service.
3. Continue research and demonstration as part of regular Division activities requiring no new funding.
4. Continue to provide copies of listings at the cost of reproduction.

The initial data base limitation to pre-school and elementary school levels was deliberately chosen. The initial year's funding is sufficient to put all currently useful titles in print recommended by basic selection tools into the data bank. The Division is already keyboarding data on all media acquired by the Center for Instructional Media for its own use, and will continue to do so.

This activity will serve to keep the data base at least partially updated. The number of new titles at this level recommended by the basic selection tools each year does not probably exceed a maximum of 2,000, so that very minimal outside funding would be needed to maintain the data base for current use (as opposed to retrospective study and research) purposes.

It has also been assumed that the cost for continuing to subscribe to the Annotated Card title information in MARC format may be continued locally for local purposes but to the data base.

Persons making special studies in various areas of children's media, here and elsewhere, will be encouraged to enter materials into the data bank, from the funding for their projects, as aids to their own research and as a contribution to research in general. Project computer programs will be available for their use.

In view, however, of the expressed need of the profession for a Children's Media Data Bank, and comments in regard to possible cooperation which have already been made while this proposal was in the planning stage, the co-directors remain optimistic that funding can be secured not only for the maintenance of the project at the level proposed for the first year, but for its continuing expansion and growth as a research and service tool.

VIII. Conclusion

This project application seeks funding in an area to which the Library Science/Educational Technology is already committed, where previous work has demonstrated competency and the existence of basic resources in equipment, personnel, and facilities. The project concept has been widely and warmly endorsed within the profession, possible project clienteles are very large, and the project itself designed to have maximum current utility as well as to test and lead into an even wider range of values for research and development. Project cost is comparatively low. We believe that the proposed project can make a contribution which will more than justify the investment of Federal funding.

Library Science/Educational Technology Division
School of Education
University of North Carolina at Greensboro

A Generalized Test and Quiz Program

by

Theodore C. Hines
Jerry Russell
Rosann Collins

A generalized test and quiz program is a handy utility for both education and fun. This one seems to us to be simple, flexible, and readily adaptable to many purposes. We use it to enable students to drill and test themselves on course content at any time during the course. We can also use it, by using a hard-copy terminal, to let students take their final examinations at their own convenience, turning in the results only when they pass. With a large pool of questions, attempting to cheat really just results in learning the material.

The program is written in Processor Technology Extended Cassette BASIC using CRT display, but may be easily adapted to other versions of BASIC and to hard copy terminals.

Questions are entered in relatively free form as DATA statements at the end of the program proper, making it easy to APPEND additional or substitute questions. Questions may be any length, as long as they do not overflow the CRT display. Questions may be of various types: multiple choice, true/false, or completion questions may be used, and types of questions may be mixed in any order. The program will accept any number of questions.

The number of questions to be presented in each round may be set by changing variable E. Questions are selected randomly from the pool of questions not already used in the current session - that is, the selection routine is so arranged that all questions are presented before any question is repeated. The program offers the users two tries at each question, and keeps score of questions answered correctly on first and second tries, reporting the score at the end of each round.

In entering the questions, each question begins a new DATA statement, and is preceded by a "Q", a colon and a space. The question is then entered line for line as you would like it to appear on the screen. The answer immediately follows, cannot be longer than one line, and is preceded by an "A", a colon, and a space. Answers must be all upper case, and only character - for - character matches are scored as correct. No provision is made for alternative answers.

While our effort was to make the program short and simple, we could not resist providing for varying the computer's responses to avoid the kind of deadly sameness that you find so often in programs of this type.

Although the program is copyrighted, permission is hereby granted to copy for personal or non-profit educational use. Credit would be appreciated. We would be glad to supply cassette tapes in Processor Technology CUTS format at $5.00 each to cover costs.

Dr. Hines is a professor at The University of North Carolina at Greensboro, Library Science/Educational Technology Division of the School of Education. Jerry Russell and Rosann Collins are Research Associates with the Children's Media Data Bank project at the University.

A COMPUTERIZED TECHNIQUE FOR PRODUCING CLOZE TEXT MATERIALS

Theodore C. Hines

Jerry Warren

A Computerized Technique for Producing Cloze Text Materials

by Theodore C. Hines

and

Jerry Warren

Abstract.--Cloze procedure has many applications in testing, research, and teaching in the language arts. A computer program permitting easy production of various types of cloze material is described. This SNOBOL/SPITBOL program is available from the authors.

As used in the language arts, cloze procedure consists of preparing text material with omissions and then requiring the user (student, subject) to guess what the omissions are or, in some cases, to supply equally appropriate information. The user is expected to do this from the syntactical and semantic cues provided by the context. Examples might be: 'One, two, three, __________' and 'The __________ sat on the mat.' The reader would be expected to supply 'four' and 'cat' to cloze the patterns.

The term 'cloze' is derived from the concept of clozure in the sense of completion. The idea is to present a partial figure or pattern to someone with the request that the pattern be completed in a logical way, based upon past experience or intuitive expectation.

Cloze procedure was first applied to the language arts by W. L. Taylor (1953). Since then, it has been used with textual materials for teaching, testing, and research in an astonishing variety of ways.

Cloze procedure has been used to measure readability: to validate readability measures; to test written and oral comprehension; to test ability to understand the syntax position of words in sentences and to use context cues; and to show or to determine the linguistic characteristics of some physical, mental, or psychological disorders: It has been used in teaching reading and reading for comprehension, in working with handicapped children, and in working with those for whom English is a second language. Cloze technique may be used to determine whether a given person would be able to read particular text material, and when used in this way is perhaps the only measure of readability which is truly individualized. This fact makes it of particular interest to teachers and librarians concerned with the production and use of written materials. The procedure can serve as an easy to use evaluation tool in teaching reading and, as a recent article by Pikulski (1976) in Language Arts indicates, as a means for reinforcing and extending both reading and writing skills. Boyce (1974) has compiled an excellent comprehesive bibliography of some 300 items relating to such applications.

The elegant simplicity of the basic concept may explain why the cloze procedure is so readily adaptable to different purposes.

One barrier to even more intensive use of the cloze procedure at the elementary teaching level may lie in the problems of preparing appropriate text. This can be a tedious process. It may pose difficulties or be subject to inaccuracy when, for example, every nth word is to be suppressed, or when some form of random omission is to be used.

Teaching or research uses of cloze may make it desirable to prepare the same textual material in different ways--with different proportions of suppressed words, or so that pronouns are omitted in one version and adjectives in another.

This paper describes the basic procedures used in a computer program to prepare cloze text. It may be used as a guide for writing a similar program in a programming language available to the reader and suitable for this purpose. Alternatively, if the reader has access to a computer system which supports either SNOBOL4 or SPITBOL, a copy of the program discussed here can be requested from the author.

So far as can be determined, only one other computer program for preparing cloze text has been mentioned in the literature, in a paper by Klare (1969). We have not seen either paper or the program, and do not know whether the latter is available.

The program described here is extremely flexible as it stands, and may be relatively easily extended. It takes in text in normal paragraphed form either from a terminal, card reader, or other input device. Text may be either in all capitals or in upper-and-lower case.

The program performs the particular suppression procedure requested by the user at the time of the run (see below). It substitutes for the omitted words either equal length underlined blank spaces of any specified length, or else provides separated underlinings showing how many letters were in the omitted word. Following the blanks, a sequence number is given in parentheses:

THE __________(1) SAT ON THE MAT.

THE _ _ _(1) SAT ON THE MAT.

The sequence number may be omitted if desired. They may be confusing to young children, for example. Punctuation following omitted words is retained:

BELL, __________,(3) AND CANDLE.

"WHERE ARE YOU, _ _ _ _,"(4) JILL ASKED.

The text material is printed out paged, with paragraphing to a specified line width since the insertion of blanks may make reparagraphing necessary.

Following the text, and on a separate page, the program prints out the omitted words in text sequence order with sequence numbers. The layout of the usual printed output is designed to permit direct reproduction on an 8 1/2 by 11 inch page size.

In addition to those described above, the program may be set to run in a number of modes. Those found useful in the present version include:

1) Omission of every $\underline{n}^{th}$ text word (Sample I);
2) Random suppression of one of every $\underline{n}$ words, with avoidance of omission of successive words (Sample II); and
3) Suppression of tagged words in the text (Sample III).

In the latter mode, any tag the user wishes may be employed. If desired, multiple tagging may be used: an asterisk for pronouns, a numbers sign for verbs, and the at sign for nouns, for example. Tags may consist of multiple characters--a $\underline{v}$ in parentheses for verbs, for instance.

In the text printout, no tags will be printed out, but only those words with the requested tag or tags will be omitted.

All of this flexibility makes it easy for the program user to produce varying versions of the same cloze text material accurately and quickly.

The modular nature of the program permits features to be added relatively easily. Features we have discussed but have had no need to implement as yet include the ability to suppress (or avoid the suppression of) words on a list supplied by the user. This could be useful in working with those readability formulae employing list of 'easy' or 'familiar' words.

Similarly, in using cloze text for some teaching purposes, it might be useful to retain the initial letter of omitted words to serve as an additional cue to the reader, or to provide text with vowels omitted, or to test spelling ability by omitting such vowel pairs as EI and IE.

At present, the program is operating in batch mode from a terminal or card reader and scoring responses by hand, but it could easily set the program to run interactively, prompting for text and for run parameters (i.e., what suppression patterns should be used for the current run), or scoring individual responses. We have toyed with, but not implemented, the idea of presenting cloze text sequentially rather than in total context, which could be most readily accomplished by using a terminal to present the text, pausing for reader response at each text omission, providing immediate feedback, correction, and the opportunity for multiple guesses.

The availability of a program such as the one described here may help encourage research, experimentation, and classroom use of cloze procedure. It might also encourage more use of the technique for quite individualized instruction and drill.

As a technical note, it might be remarked that for computer applications of this type SNOBOL/SPITBOL is far easier to work with than, for example, PL/I or its dialects, although PL/I is perhaps the next most satisfactory language available. Applications such as the one discussed here are quite economic, runs usually costing from one to five dollars.

The Library Science/Educational Technology Division of the School of Education of the University of North Carolina at Greensboro is doing considerable programming work in such areas as information science applications and automation for school media centers, readability formulae, and text handling. Correspondence and reprints from others in these and related areas are most welcome.

Author Note

Dr. Theodore C. Hines is Chairman and Professor, Library Science/Educational Technology Division, School of Education, University of North Carolina at Greensboro. Jerry Warren is Research Associate for Computer Applications at the same institution.

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SAMPLE I

In this sample section of cloze text, every fifth word has been suppressed by the computer program. This type of cloze text is often used to determine whether an individual student can read particular text material. The material is considered readable if the student can supply 60% of the missing text words correctly.

IN THIS SAMPLE SECTION __________(1) CLOZE TEXT, EVERY FIFTH __________(2) HAS BEEN SUPPPESSED BY __________(3) COMPUTER PROGRAM. THIS TYPE __________(4) CLOZE TEXT IS OFTEN __________(5) TO DETERMINE WHETHER AN __________(6) STUDENT CAN READ PARTICULAR __________(7) MATERIAL. THE MATERIAL IS __________(8) READABLE IF THE STUDENT __________(9) SUPPLY 60% OF THE __________(10) TEXT WORDS CORRECTLY.

1. OF
2. WORD
3. THE
4. OF
5. USED
6. INDIVIDUAL
7. TEXT
8. CONSIDERED
9. CAN
10. MISSING

SAMPLE II

In this sample section of cloze text, one of every five words has been randomly omitted by the computer program used to prepare the text, except that the omission of adjacent words is not allowed. The idea is that it would be too difficult to supply two words at a time.

IN __________(1) SAMPLE SECTION OF CLOZE TEXT, ONE __________(2) EVERY FIVE WORDS HAS __________(3) RANDOMLY OMITTED BY THE COMPUTER __________(4) USED __________(5) PREPARE THE TEXT, EXCEPT THAT THE __________(6) OF ADJACENT __________(7) IS NOT ALLOWED. THE __________(8) IS THAT IT WOULD BE TOO DIFFICULT __________(9) SUPPLY TWO WORDS __________(10) A TIME.

1. THIS
2. OF
3. BEEN
4. PROGRAM
5. TO
6. OMISSION
7. WORDS
8. IDEA
9. TO
10. AT

SAMPLE III

*In this sample *of input, #we have tagged all *of #our prepositions *with an asterisk, and all *of #our pronouns *with a number sign. If #we ask #our program *for the omission *of prepositions, #it will eliminate #them and #it will not print *out #our number signs.

__________(1) THIS SAMPLE __________(2) INPUT, WE HAVE TAGGED ALL __________(3) OUR PREPOSITIONS __________(4) AN ASTERISK, AND ALL __________(5) OUR PRONOUNS __________(6) A NUMBER SIGN. IF WE ASK OUR PROGRAM __________(7) THE OMISSION __________(8) PREPOSITIONS, IT WILL ELIMINATE THEM AND IT WILL NOT PRINT __________(9) OUR NUMBER SIGNS.

1. IN
2. OF
3. OF
4. WITH
5. OF
6. WITH
7. FOR
8. OF
9. OUT